

In 1965, William T. Knox, who replaced Kelley in 1964, as OST technical assistant, as well as Ely as Chairman of COSATI, was now in full command, assisted by Aines, also a technical assistant to the Director, OST, the Executive Secretary of COSATI. Responsibilities had been sorted out between OST and NSF for scientific and technical information leadership. Hornig was in full control of OST, PSAC and FCST. The STI focal points, supported by the Executive Office of the President, Congress, FCST and their R&D directors in each agency, were energetic in seeking new cooperative ventures within and outside of the COSATI program.

One example of this cooperation was seen in an agreement effected by DOD and NASA on research and technology information exchange.¹ The exchange would be facilitated by the use of a standardized reporting form for on-going work suited to automatic processing. The agreement was binding upon the Army, Air Force and the Navy as well as upon NASA's Office of Manned Space Flight, Office of Advanced Research and Technology, Office of Space Sciences, and Office of Tracking and Data Acquisition. The News Magazine went on to state:

Ultimately it is hoped that the plan of operation established by the agreement will be extended to other Federal agencies, notably the Department of Commerce Office of Technical Services and the National Science Foundation. Copies of the agreement are being sent to all Federal agencies engaged in R&D programs, inviting them to participate in FY 1965.

The gains to be registered by the new format and the interagency agreement were stated as:

R&D personnel will have improved knowledge of work underway in their fields. Machine processing will keep it current and readily usable. Management will have improved knowledge about on-going work. Each agency will be aided in its internal planning, programming and budgeting. More powerful interagency decisions can be made regarding program goals and balance.

¹ Army R&D News Magazine, DOD, NASA Agree on Information Policy, September 1964, pp 2, 8 and 9.

The news article explained that the new basis of common information exchange will be a standard reporting form titled "Research and Technology Resume," NASA Form 1122 and DOD Form 1498. It was "conceived as the climax of several months of intensive studies, discussion and compromise of different viewpoints." The essence of the agreement is the 26 common information elements, the common set of definitions and codes, and the common digital machine language representation of the 26 elements. It would not inhibit the agencies in use of forms to collect input data. It could be used for classified and unclassified work project-reporting. There was agreement that the resume would be completed by both agencies at the lowest practicable reporting element, defined as the "work unit," which terms cancels and supersedes the terms subtask in DOD and task in NASA. The next echelon above the work unit would be called the "task area." The work units would be exchanged semi-annually at the start in both paper and machine-readable form. The agencies agreed that all unclassified resume information would be releasable without prior approval of the originating agency, unless restrictions to release were stated. Several ad hoc groups were established to monitor and accelerate the program.

Six years later, the Acting Administrator of NASA, George M. Low, wrote a letter to the Director of defense Research and Engineering, suggesting that action be taken to exchange terminals so "that each activity can tap the other's information bank, for experimental or operational purposes, and thus become jointly familiar with the characteristics of the two on-line computer systems now in use or under development...(This would) permit the first interagency access to the respective information systems and facilitate a more timely exchange of (bibliographic) information between NASA and DOD."

¹ Letter from George M. Low, Acting Administrator, NASA, to John Foster, Director of Defense Research and Engineering, DOD, dated October 21, 1970, pp 2. (unpublished)

These two actions did not result from direct COSATI or OST interventions. They reflected the policy expressed earlier by Dr. Hornig when he stated in his testimony before the House Appropriations Subcommittee in 1964 that "OST will engage only in the minimum core of work relating to policy, overall planning and ratification of standards. Everything else will be done in agencies outside the Executive Office." What needs to be stressed two decades later is the "spirit" that existed in OST that encouraged the kind of actions that NASA and DOD had undertaken.

The year 1965 was a pivotal year for COSATI. As pointed out in its third annual report,¹

Until that time, COSATI looked inwardly at the government information activities with the object of improving their efficiency. But in 1965 it became evident that such an improvement would not be easily achieved without the recognition and involvement of the ... nongovernment and the international communication sectors. This realization, prodded by the emergence of several private studies (described in Chapter I) recommending the establishment of a national information system, gave birth to COSATI's enlarged orientation, the inclusion of a planning platform for an improved national information network. The establishment of a special Task Force on the National Systems for Technical and Scientific Information signaled this turning point.

Unmentioned in this statement about COSATI launching a national systems effort is Admiral Martell's earlier statement to Wiesner that COSI agreed with the substance of the Suttle Report, described in 2.3.1 (p.11), that "no useful purpose would be served by further study of the delegated agent concept at this time." Clearly, the requirement to explore the delegated agent concept that Weinberg believed was "the central organizational recommendation" in his PSAC Report, was not going to be bypassed by OST, even though the COSI members had their doubts about the viability of the concept. The obstacles to the establishment of a national network approach are mentioned in the COSATI 1965 Report:

¹ Committee on Scientific and Technical Information, Federal Council for Science and Technology, Executive Office of the President, Progress of the United States Government in Scientific and Technical Information - Toward a National Information System, 1965, pp 42.

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To bring the myriad elements together into a national network is not a quick or simple task. It must be done without disruption of existing information channels. It must take into account the widely differing capabilities of existing systems and the realities of funding, long-established practices, rapid changes in information technology, and the differing needs of various segments of the user community. It must accommodate the systems still using traditional, manual methods of information storage and retrieval, as well as those few at the very cutting edge of mechanized information technology. The process must be one of evolution, not revolution. Furthermore, it must be evolution by consensus and not by directive. It is clearly recognized that the Government cannot direct the private activities that form a major element of the national information capability; it can only attempt to supply precept and example in its own information programs and persuade the private community to join forces in a national system. Of course, such persuasion is more effective if the private information systems have a voice in national system's development. (p.2)

The correctness of this sobering appraisal will emerge as the account of the work of the National Systems Task Group is developed.

The Chairman of the TG on National Systems for Scientific and Technical Information (TGNS) was William T. Knox and the Executive Secretary was Andrew A. Aines, both from the OST staff. Other members were: Burton W. Adkinson (NSF), Walter M. Carlson (DOD), Melvin S. Day (NASA), Ellis A. Johnson (DHEW), Fosger E. Mohrhardt (USDA), Donald A. Schon (DOC), John Sherrod (AEC). J. Lee Westrate (BOB) was one observer. For the most part, the cast was the driving force of COSATI itself.

The terms of reference for the TGNS called for: 1/ Inventory and evaluation of resources (people, services, equipment, funds, etc) and determination of a wide range of users in the public and private information sectors, and 2/ Recommendations and plans for the development of national information system(s), including actions to implement them. Also required were steps to move from current to advanced information systems.

To assist the TGNS, a contract was given to the System Development Corp. of Santa Monica, California. The Team Leader was Launor F. Carter. He was assisted by Gordon Cantley, John T. Rowell, Louise Schultz, Herbert R. Seiden, Everett Wallace, Richard Watson, and Ronald E. Wyllys. SDC also

an advisory group, consisting of: Raymond Barrett, Harold Borko, Carlos Cuadra, Lauren Doyle, Harold Edmundson, Robert Katter, Frances Neeland, and Robert Simmons. Others involved were: C. West Churchman, William G. Biel, Merrill Flood, Earl E. Partridge, Lorimer F. McConnell, and Don R. Watson. It was acknowledged that SDC had gone "all out" to assemble an outstanding cast to assist the TGNS in its undertaking. In turn, the Task Group decided that it would not inhibit the SDC team in making its recommendations. The funds for the SDC study were provided by the ^{member agencies of} Office of ~~Science Information Service~~, National Science Foundation.

It should be acknowledged that both the COSATI TGNS and the SDC worked hard to undertake the requisite studies and coordination needed. Launor Carter and the SDC team made periodic reports on their findings and conclusions. The teamwork between the two bodies was first-rate. The SDC team spent much of its time in Washington, D.C., operating out of the local SDC office. The reports were completed late in 1965. It was decided that the SDC study would be included as Appendix A of the TGNS Report. ¹

In his cover letter to the Chairman of the Federal Council, Donald F. Hornig, Knox wrote:

As you requested, an ad hoc task group from COSATI has endeavored to develop the conceptual framework for an improved national network of information systems in science and technology. This is the beginning of a comprehensive attempt to develop guidelines for planning, so that information activities within each department and agency might be developed in a coordinated, nonduplicative manner...The reason for the study is the close relationship between R&D and information systems in science and technology. Although a good information system does not guarantee good R&D, the lack of a good information may be harmful to effective and efficient R&D programs. The job is not done. I take pride, however, in forwarding this report on the first phase of the study, dealing with the document-handling systems in the United States.

¹ Knox, William T., et al, Recommendations for National Document Handling Systems in Science and Technology, Committee on Scientific and Technical Information's Task Group on National Systems for Scientific and Technical Information, Federal Council for Science and Technology, Washington, D.C., 15 November 1965, pp 18. (2 appendices: SDC Background report and the charter for the COSATI TGNS)

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The Report starts off with a background review, summarizing findings and recommendations of the Baker Report (1958), the Crawford Report (1962) and the Weinberg Report (1963). These are covered in the first chapter of this book. Following the background is a statement of the problem, the gist of which asserts that in late 1964, the time was ripe for another attempt to fashion a more effective and efficient national network of information systems in science and technology. A special task force was formed to undertake a very ambitious task, no less than the design of a national system or network of systems to serve the needs of scientists, engineers and their managers "in such a way as to promote the more effective execution of the national R&D program." From the outset, the TGNS

looked on its assignment as a systems engineering problem. Initial attention was focused on that part of the system dealing with document handling. Left for later analysis were the less-well defined areas of initial distribution of R&D results, secondary services, critical information analysis and evaluation functions, and the important oral communications network that exists throughout science and technology.

The role of the SDC study team is acknowledged, stating:

The (SDC) report contains a wealth of valuable information, and its evidence, its conclusions, and its recommendations were considered at length by the task group. The task group's recommendations differ considerably from those presented by SDC, although there is general agreement with the SDC statement of basic propositions or assumptions, and systems requirements.

The report then provides a fairly lengthy list of basic assumptions which turn out to be nearly identical with a corresponding statement in the SDC report. The assumptions are: (pp 5-9)

- 1/ The Federal government has the responsibility to ensure that there exists within the United States at least one accessible copy of each significant publication of the worldwide scientific literature.
- 2/ The Federal government has the responsibility to see that there is appropriate acquiring, announcing, processing, and making accessible the significant worldwide scientific and technical literature to qualified individuals and organizations in the U.S.
- 3/ Any system(s) must take account of primary publications, secondary publications, and processing of these.
- 4/ Information centers are a permanent part of any national systems for handling STI.
- 5/ A critical part of the STI system is in the nondocument area, such as oral communications, conferences, and symposia.

6/ There will be important portions of the national information system(s) (e.g. publishers, abstracting and indexing activities, research libraries) independent of the Federal government. The impact of the Federal portion, in terms of subsidy, cooperative services, and leadership, will have an important influence on the nonfederal portion, and this relationship must be continuously explored and defined with the government taking such actions as are necessary to maintain a viable system.

7/ The document-handling system(s) will service a wide variety of users, such as: scientists and others working in universities; those working in the public and private sectors; and administrators and managers.

8/ The introduction of advanced technology into the national document-handling system is required. Manual systems will be inadequate to handle the future loads.

9/ The cost-effectiveness ratio for introducing new technologies ...needs to be determined in terms of services rendered...

10/ Any systems proposed must be evolutionary...and flexible...

11/ The systems developed for scientific and technical literature need not necessarily be compatible with systems used for other parts of the world literature, such as law, the arts and the humanities. Indexing, cataloging, processing and storage systems for scientific and technical literature may be different from that of other literature. (This assumption may not be as viable as some of the others in light of the strong trend towards databases and interactive information systems. AAA)

12/ Classification and indexing schemes adopted for our national systems will be as compatible with international procedures and standards as is feasible.

The next section of the report lays out general management requirements. There is a need for overall policies and plans dealing with the Federal government's role in STI activities and how they need to be coordinated and monitored. Policies and recommendations dealing with legislative bases for Federal agency information services in respect to national information systems need to be developed. More definitive guidelines are required for costs and budgetary analysis and control of agency information systems. A central review is needed of each agency's budgetary program as it related to the national system(s). Central coordination is required in the development of long-range plans for the national document-handling and information systems, including plans for the establishment of facilities serving various elements of the system, such as central referral or switching facilities and research project registries.

Following the general management needs is a section devoted to systems requirements. There are more of these than can be covered in this short account, but the first one is described as exemplary of the others:

A number of large-scale experimental information and document-handling programs will be required in order to determine detailed design data for an integrated national network of systems.

By way of explanation, the report states:

Implicit in this requirement is a need that the system evolve from the present situation. The 1965 OST (Licklider) Panel on Scientific and Technical Communications stated in its report,¹ covered in more detail in the first chapter, "It is not the time yet to design a national system for scientific and technical communication. It is the time to start developing an overall conceptual framework for a national system; a plan to guide research and development. Moreover, it is time to build experimental or exploratory systems capable of handling actual problems and perhaps of growing or evolving into operational systems." The COSATI task group agrees with this statement. The MEDLARS project at the National Library of Medicine, the network of state-based information centers to be established under the State Technical Services Act of 1965, the AEC and NASA computer-based abstracting and indexing services, the new computer-based chemical information system of the Chemical Abstract Service...are all examples of large-scale information transfer experiments which will lead to improved systems design and integration.

A "conclusions" section follows, again, too long to repeat, but the many individual conclusions add up to a belief that "there is need for an integrated national network of document-handling systems in science and technology;" and because of the Federal government's major involvement in science and technology, it should "assume the leadership in the evolution of the information and document-handling systems network."

The TGNS recommended that:

OST accelerate its efforts on the overall planning, policy formulation, organization, coordination, and evaluation of the integrated national network of information and document-handling systems in science and technology. It should also clarify areas of responsibility among the Federal agencies in this area.

¹ Licklider, J.C.R., et al, Report to Dr. Donald F. Hornig, Director, Office of Science and Technology, by the OST Ad Hoc Panel on Scientific and Technical Communications, Washington, D.C., 8 Feb. 1965

It set up three immediate tasks for OST to be taken in collaboration with the Bureau of the Budget, Federal departments, agencies, and other organizations involved in science and technology:

- 1/ To develop a comprehensive, coordinated program for ensuring the acquiring, cataloging, and announcing of the significant worldwide scientific and technical literature. The establishment of one or more national libraries in the fields of science and technology in addition to medicine and agriculture under the aegis of appropriate Federal departments and agencies should be considered parts of the integrated network.
- 2/ To develop policies concerning the legislative bases for document and information services in or sponsored by the departments and agencies.
- 3/ To propose or endorse legislation necessary to enable departments and agencies to assume responsibility for ensuring effective information and document-handling services in agreed-upon areas of science and technology.

Again, focusing on OST, the report asked that OST in collaboration with the appropriate Federal agencies should encourage the private sector to formulate document-handling plans and programs for its consideration in the development of the integrated national network.

It called on COSATI to recommend several actions:

Develop a coordinated plan and criteria for Federal support of experiments in the technology of information science, including prototype information systems designed to provide design data for the integrated national network. High priority tasks called for the development of standard procedures for processing documents to facilitate interagency exchange; the development of guidelines for cost and budgetary analyses and control by agencies of their document and information services; the development of education and training curricula for the operators and users of the information systems.

The report was presented to PSAC and to FCST. The latter recommended that the Director, OST, initiate the exploratory operation of a central mechanism that would provide a comprehensive, coordinated program to ensure that significant worldwide scientific and technical literature be acquired, cataloged and announced. With the expectation that OST would assume the leadership in devising such a central mechanism, COSATI turned its attention to the problems inherent in informal and oral communications and to more specific problems of data-handling.

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But this is not the full story. What was it that the SDC study team recommended that the TGNS would not or could not accept? After all, the Systems Development Corporation was an experienced research and evaluation group fairly familiar with government operations. It was as knowledgeable a company as there was around insofar as information systems were concerned. The team and the advisory group that it had assembled to do the job were highly respected. Moreover it was a hard-working group as well, delving deeply into the a mountain of data, trends, and painstakingly scrutinizing every study undertaken of Federal and national STI. This can be seen in the publication put out by SDC in 1967.¹ It is divided into four parts. The first part describes the present system of document-handling institutions, the flow of documents, and the users of documents. The second part addresses the national document-handling problem and basic propositions and system requirements. Part III, which consists of four chapters, addresses alternative approaches to the problem. The first chapter, a very useful one, reviews selected plans for national document systems; the second addresses the capping agency and responsible agent concepts; the third expounds on the concept of new operating agencies; and the fourth explores the concept of strengthening the present system. Part IV is made up of two chapters; the first provides an evaluation of alternatives and the second paints a picture of the present status and future programs. There are also three appendices a glossary, and a selected bibliography. All in all, it is a formidable book that will be valuable to scholars for years to come. With all of the valuable knowledge and ideas it contained, some of which were added before it was released in 1967, what did the Task group on National Systems find about its recommendations

Carter, Launor, et al, National Document-Handling Systems for Science and Technology, Systems Development Corporation, Santa Monica, California, published by John Wiley & Sons, Inc., New York, 1967, pp 344.

that they could not incorporate into its own report and recommendations?

The SDC report called for the establishment of a capping agency to be called the Scientific and Technical Information Bureau, whose functions would include the formulation of policy regarding the areas of responsibility for national S&T information and documentation activities. It would also formulate policy for nongovernmental libraries, information centers, government depositories, support of nongovernment publications, nondocumentary communications. It would collect statistical information, establish standards, recommend information science research, formulate policies for the training of librarians and information technologists, formulate copyright and patent policy and for foreign documents, perform budget review and funding control, formulate policy for legislative relations and legal matters, and develop long-range plans. The STI Bureau would be an independent Federal agency, operating under the President, similar in status to the Civil Service Bureau. Possibly, it could be placed in the Bureau of the Budget, the General Services Administration, or even the National Science Foundation. It would have a total staff of 120 people.

An alternative to the Bureau was a concept of a system of responsible agents, which was built on the delegated agent concept, an extension thereof. The Federal agencies would be the responsible agents for dealing with subsets of the spectrum of science and technology, however, it was not necessary that the responsible agents be the information service performers. They would free to 'delegate' service functions to groups within the government or outside. SDC chose the responsible agent concept as the most desirable way to solve the national information problem. Also suggested was a new Federal agency with operating responsibilities, and, alternatively, a government-chartered corporation with the same kind of function along the lines of the Tennessee Valley Authority or the Communications Satellite Corporation. Another alternative was a national library admin-

istration that could be built on the foundation of the Library of Congress. The SDC study studiously provided the advantages and disadvantages of all of its proposals, including a recommendation to strengthen the present system. A comparison of all of the proposals is made and consolidated on pp 262 and 263 in the book. The recommended design turned out to be the bureau/responsible agent concept. New funds would be required for the bureau and for new functions that the responsible agents would take on, but a comparison revealed that it would be the most cost-effective approach.

Earlier in this account, it was mentioned that the SDC study group was given a free hand to come up with recommendations for a national document-handling system. This was probably an error in judgement, even though SDC wisely provided a range of options from the establishment of a bureau to the strengthening of current operations and responsibilities. The proposition that the bureau/responsible agent/^{approach}ought to be supported was regarded by the members of COSATI as too costly and a political impossibility, to boot. Despite the need for a national information system that all parties seemed to agree was a desirable goal, the environment was not quite ready for an information agency that would cost millions of dollars to operate, and probably could through design or accident erode agency control over their information programs. At least one answer to the question: why did not COSATI "buy" the SDC recommendations? might have had to do with an implied threat to the information-independence of the Federal R&D programs. The overt response of the COSATI group was that OST take on the responsibility of attaining progress in the national systems area. [Recognizing that the Congressional Appropriations Subcommittee balked at providing spaces for four professionals, OST found itself boxed in, and proceeded to ^{do} the best it could do under such circumstances -- seek to get help from the agencies to augment its staff.]

Brought before the Federal Council, the report of the COSATI Task Group on National Systems for National Science and Technology, a decision was made not to accept the key recommendation for the establishment of a supervisory agency,¹ but reached agreement that:

The Director of OST will initiate, on an exploratory basis, the operation of a central mechanism which will provide a comprehensive, coordinated program to insure the acquiring, cataloging, and announcing of the significant worldwide scientific and technical literature. The Council was of the opinion that study of the nature of a central mechanism rather than naming of a "supervisory agency" was the appropriate next step, and such a study was in progress at the end of 1966. (p.29)

The net effect of the FCST decision was to support the views of COSATI that whatever was to be done with the recommendation of TGNS and SDC studies would be the responsibility of the Office of Science and Technology. That milestone passed, the Task Group on National Systems, convinced that document-handling was only one thread in the tapestry that made up science communications, moved on to new areas. The FCST Report for 1965 and 1967 states:

The Task Group decided that, as a sequel to its work on document-handling systems, it would investigate during its next phase such areas as abstracting and indexing service, data-handling systems, and oral and informal communications. Subsequently a contract was given to a private contractor to conduct a study of the present status and effectiveness of current abstracting and indexing services, to make recommendations of the optimal role of these services in the next decade, and to recommend specific actions to be undertaken by the Federal Government. The study is being funded and administered by the National Science Foundation for COSATI. Plans were also made to contract out studies of oral and information communications and of data collection, reduction, analysis, and dissemination. The Advanced Research Projects Agency of the Department of Defense has provided the funds for the two studies. (p.29)

Very properly, the leaders of COSATI recognized that there were other events taking place within the government that could be considered as milestones toward a national information network. In addition to the National Systems Task Group Report, a significant accomplishment in the battle for better Federal and national STI programs, regardless of its lack of immediate approval and implementation, there were two

¹ Federal Council for Science and Technology, Activities of the Federal Council for Science and Technology, Report for 1965 and 1966, Executive Office of the President, pp 47.

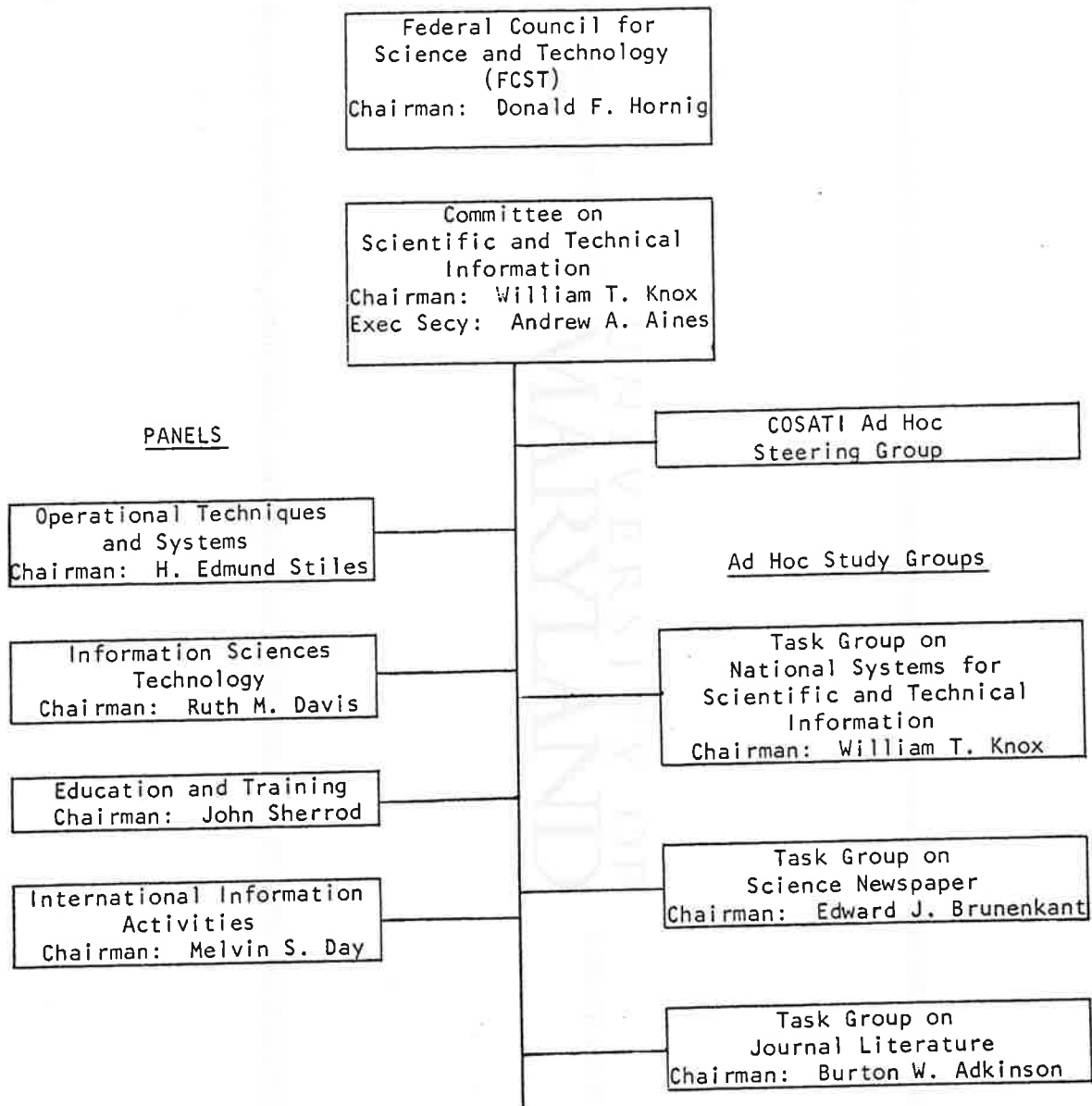
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developments of a positive nature cited in the COSATI 1965 Progress Report. The first of these was the passage of the State Technical Services Act then in the early stages of development. This was a Federal-State program to make information of value available through State-operated information and development centers. Technical information generated through Federal R&D was considered a choice resource for this purpose. The second milestone was the establishment of standards for STI by the U.S. Civil Service Commission, which was regarded at that time as tangible evidence that the STI profession had become a permanent part of the manpower requirements of the Federal. (p.9) In subsequent years, the State Technical Services Act, which operated with a small Department of Commerce staff and matching Federal-State funding, and which had been declared successful, was terminated by the failure of the Department of Commerce to seek funds for the program. Several of the States still maintain their centers for economic development purposes. All of the States which had entered the arrangement with enthusiasm (and funds) were unhappy with the decision of a Secretary of Commerce to cease operations, citing it as an example of the lack of Federal follow-through on commitments. No study has ever been undertaken to determine what happened to the flow of Federal STI to the States in subsequent years.

In 1965, COSATI was involved with several other activities, other than its quest to "solve" the national information problem. The organization of COSATI is shown in Chart 2. Federal Organization for Scientific and Technical Information (attached), which appeared on page 6, of the COSATI 1965 Progress Report. The name of each of the panels and ad hoc task groups reveals what it was brought into being to accomplish.

In June 1965, the Panel on Operational Techniques and Systems was formed to 1/ identify needs for improved agency policies, programs and practices relating to STI; 2/ Develop and recommend new programs to bring about the desired improvement; 3/ facilitate more effective overall planning, management and evaluation of the STI efforts of the Federal agencies; and 4/ recommend new policies and practices to improve the

Chart 2. FEDERAL ORGANIZATION FOR SCIENTIFIC AND TECHNICAL INFORMATION



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the effectiveness and efficiency of operational systems. As implied by its title, the Panel had jurisdiction over a wide range of activities: acquisition, accession, abstracting, indexing, announcement, distribution, terminology control, equipment compatibility and convertibility, wholesale and retail resources, specialized information centers, libraries and depositories. To operate effectively, the Panel was authorized to establish ad hoc and other working groups. The 1965 Report, showed the Operational Techniques and Systems Panel monitoring governmentwide central information services. Five services are identified and their progress reported.

Science Information Exchange. Operated by the Smithsonian Institution and supported by the National Science Foundation, SIE furnishes reports on research planned or currently in progress. In the past year, input of such information reached 100,000 projects and proposals, double what was received in 1962. There were 562 Federal and other agencies participating in the program. Coverage had reached 95 percent of all Federal life science research and about 75 percent of all basic and applied R&D in the physical and engineering sciences.

National Referral Center for Science and Technology. NRC was referred to as the "information desk" of the scientific and technical community. It is operated by the Library of Congress with the support of the National Science Foundation. The Center does not answer technical questions or provide bibliographic service, functioning only as an intermediary, directing those who need information to those who can provide it. In 1965, it published A Directory of Information Resources in the United States - Physical Sciences, Biological Sciences, and Engineering, also A Directory of Information Resources in the United States - Social Sciences.

Clearinghouse for Federal Scientific and Technical Information. In 1965, this organization, operated by the Department of Commerce, completed its first year of activity. devoted to the announcement and dissemination of technical reports produced in the Federal R&D agencies. In 1965, there were 45 organizational contributors. The Clearinghouse has over 434,000 titles and handles some 5,000 requests a day.

Industrial Referral Service. This service was developed in the Clearinghouse in 1965 to promote interchange between producers and users of information by using rapid automatic retrieval techniques

Technical Literature Searching Service. A current and retrospective technical literature searching service available for a fee covering reports and translations of DOD, NASA and other agencies. This program also assembled 25 packages of information on subjects of significant industrial interest resulting from Federal R&D.

The 1965 Report also reported on the status of Federally-supported Specialized Information Centers, extolled in the Weinberg (PSAC) Report in 1963. AEC opened four new ones in 1965 (Man-Made Radiation in the Biosphere, Rare Earths, Atomic and Molecular Processes, and Radiation Chemistry), bringing the total to 19 that AEC supports fully or in part. DOD supported 21 centers in a broad range of activities. NASA stated that it supports

special centers in the Apollo Program. In DHEW progress was also reported. The Public Health Service has created a number of centers. The Division of Air Pollution has established a Technical Information Center. The Office of Pesticides has designed a Pesticides Intelligence System. Poison Control Centers are dispersed throughout the United States. The National Institutes of Health list seven: Mental Health, Cancer Chemotherapy, Parkinson's Disease, Diabetes, Brain Research, Communications Disorders, and Toxicology. DHEW also has a Clearinghouse on Smoking and Health, National clearinghouse for Mental Health. Other agencies also identified specialized centers..

In the area of standards, COSATI issued one on descriptive cataloging and another on subject-categories mentioned previously. Also prepared was Federal Microfiche Standards to be applied to microfilming of reports by all Federal agencies. The Department of Agriculture followed COSATI's lead and issued an Agricultural/Biological Subject Category List. The Library of Congress reported progress in a project to convert catalog records into machine-readable form. Three agencies, Smithsonian Science Information Exchange, Commerce's Clearinghouse for Federal STI, and DOD all reported progress in developing systems for recording and disseminating information on active research projects. Similarly several agencies indicated that improvements in announcement media were achieved in 1965.

Also formed was the Panel on Information Sciences Technology, whose functions were to ensure an orderly development of information science technology, avoid unnecessary duplication of R&D efforts, identify and eliminate gaps in technology, improve users' receptivity to new technology, and assure an orderly transition from obsolete to improved systems. The Chairperson of this group was Dr. Ruth M. Davis and the Executive Secretary was Dr. Harold Wooster, both of the Department of Defense. The Panel

selected as its areas of interest: information storage and retrieval, from data compilation and conventional bibliography through documentation research; the theory and practice of optical information processing; natural languages and linguistics, those aspects of computers related to information processing, including processing of biomedical data and hospital records; and computer-aided logical processes, from bionics through human information processing (either individually or in groups situations) to formal logic. One of the first steps taken by the Panel was a survey of existing Federal agencies' programs in information technology. Answers were received from 14 agencies, citing in varied detail some 700 R&D efforts. These data were published, subsequently.¹ The listing was also placed in a data base prepared by the Mead Data Corporation in machine-readable format. After reviewing the inventory, the Panel created its next product, an outline of eight areas to be explored in the next two years. Examples of the outline follow: (p.29)

1/ Validation of the hypothesis that a network should be established of facilities that can operate either as laboratories or test beds for experiment with, and evaluation of information systems and practices.

2/ Use of consultants or contractors sponsored by Federal agencies to assist members in formulating measures of effectiveness and evaluative criteria for essential aspects of information systems and practices.

5/ Definition of the scope and interests of the field of information sciences technology as it relates to the panel's interests.

7/ Determination of the desirability and feasibility of establishing a standard bibliographic control and abstract sheet for the results of Federally sponsored research, wherever published.

The Panel then reported what nine agencies were doing in the area of R&D in information sciences. These are not listed in this document because of the size of the list, but it is interesting to note that there were as many as nine agencies active in this area in 1965. Almost twenty years

¹ Davis, Ruth M., et al, A COSATI Inventory of Information Sciences Technology, Activities of Certain-U.S. Government Agencies, Committee on Scientific and Technical Information,, Federal Council for Science and Technology, Washington, D.C. April 1966, pp .

later, only a few agencies are still doing R&D in information science technology, which raises an intriguing but unanswered, perhaps unanswerable, question: have the agencies reached such a point of information efficiency and success that such R&D is no longer needed? Obviously, the Federal establishment has not arrived at such a level of quality in their STI programs that they can afford to be satisfied. What is missing is a body like COSATI to ask the question: what R&D in information science technology in your agency is going on currently to contribute to the accomplishment of your agency's mission? What is also missing are agency R&D heads who invest time and energy to understand STI needs as thoroughly as they do manpower and instrumentation requirements of their programs. The need for trained STI workers was a constant source of worry during the early- and mid-1960s. Because universities were not training individuals at that time to be information scientists and managers of large scale programs, COSATI established a Panel on Education and Training, under the chairmanship of John Sherrod, Atomic Energy Agency. His executive secretary was Charles Gottschalk, also of AEC. Three tasks were assigned to this task group: 1/ to identify educational and training activities now supporting the STI programs of the Federal agencies; 2/ to ascertain needs for improvements in agency policies, programs and practices relating to education and training in STI; and 3/ to develop and recommend actions to improve education and training policies and programs for users of STI and workers in the STI field.

After it began a series of meetings, the panel identified as its goal:

...to plan programs to encourage the use of information media, sources, and systems in science and engineering through the introduction of appropriate courses into existing educational curricula and to recruit and train specialists in the field of STI. (p 34)

This goal was further divided into specific objectives, such as: reviewing and improving classification standards and salaries for STI workers; preparation of suitable texts and other course materials; and development

of on-the-job training curricula in Technical information-handling for working scientists and engineers. But the first undertaking of the panel was to take steps to prepare an inventory of Federal and intergovernmental activities in support of educational and training programs in science information. This was followed by the establishment of liaison with the Office of Education which was developing a program for education and research support in the information sciences, under Title II of the Higher Education Act of 1965. The panel also began to work closely the National Science Foundation and several universities that were developing graduate courses and curricula with NSF grants dealing with information science. Within the government, it began to interact with the Civil Service Commission in the development of Federal training courses.

One of the recommendations for National Document-Handling Systems was a requirement that there would exist within the United States at least one accessible copy of each significant publication of the worldwide scientific and technical literature. COSATI had undertaken a precursor step in late 1964 with the publication of "International Data-Exchange Agreements and Arrangements of Agencies of the United States Government," previously discussed. The report highlighted, perhaps for the first time in the history of the United States Government, a number of weaknesses; lack and inconsistency in policy, failure to keep tabs on what was on the books and what was being interchanged, and the establishment of a responsible focal point to monitor the area, to name a few of the findings. To give further illumination to the problems and issues of international STI interchange, COSATI formed the Panel on International Information Activities with Melvin S. Day of NASA as the Chairman and Harold L. Goodwin of the same agency as the Executive Secretary.

The terms of reference for the panel directed it to: recommend policies and programs regarding acquisition of foreign-produced STI; to do the same for Federally-produced STI dissemination abroad; to recommend actions

leading to improved techniques for acquiring, translating and disseminating foreign produced STI; to recommend ways to improve governmental organization for increasing the efficiency of interchange; and to suggest policies for U.S. agencies concerning the role of nongovernmental organizations and their support in international information exchange. The panel was made up of a mix of Federal agency STI managers, representatives from the State Department, and the International Committee of the Federal Council for Science and Technology.

In its preliminary discussions, the panel recognized the new role the United States had adopted after World War II as a primary source of STI for the world. Most of the world leading countries were suffering from the effects of disruption and devastation that included their R&D programs. It became U.S. policy, starting with the Marshall Plan, to provide aid, including STI. U.S. scientists were cooperative, also, because of the fact that much of the scientific and technical knowledge produced in the world before World War II came from Europe. Thus, to some extent, they were repaying a long-standing debt. STI outflow from the United States to the rest of the world became considerable. As the recipients returned to normal activities, undertaking their own R&D programs once again, it was the consensus of the Federal STI managers that they were parsimonious in matching what we were exporting to them. About this time, the Federal agencies found it expedient to require bilateral arrangements with counterparts in foreign countries to stimulate the return flow to the United States. The quid-pro-quo approach helped achieve some of the missing balance. However, the tradition then was that the unclassified, unlimited Federally-generated STI would flow freely. The "openness" of the United States was such that the act of making STI available within the United States almost made our STI available to the rest of the world. The goal of ensuring that at least once accessible copy of each significant publication of the worldwide literature was still unachieved.

The panel found that one other development was taking place, the development of machine-readable databases to "control" the proliferating scientific and technical literature and data. It took little imagination on the part of all information scientists and engineers the world over that this movement, which was becoming prevalent in the Federal agencies, would dramatically change the way STI would be handled and interchanged. The work of the International Panel brought, for the first time, the community involved in international interchange of STI together to operate in a coordinated manner. Insufficient credit has been given COSATI for its trail-blazing efforts in this field. Unfortunately, the lesson that was learned about the need and value of keeping such a group working together was forgotten by the Federal R&D leadership in subsequent years.

During the Spring of 1965, an interesting proposal was sent to William T. Knox, OST, from Vincent E. Giuliano, an information scientist and researcher at Arthur D. Little, Inc., Cambridge, Mass., and two associates.¹ The proposal explains that "national interest" was the primary reason for its preparation, but there was also a hope that A.D. Little might play a role if the proposal was found acceptable. Nevertheless, there are a few parts of the Summary of Conversations that deserve resurrection, because of the depth of understanding of the issues and trends of the day.

The increasing activities of the Federal agencies in the development of complex systems for coping with the scientific and technical literature was noted. Traditional library-oriented patterns for handling information were being replaced by processes still largely unevaluated. Lacking also is the rational management of this emerging program of investment and commitment, and just how well the new approaches fill the real needs of

¹ Giuliano, Vincent E., Jones, Paul E., and Murphy, James, Management of National Information Programs: Technical Support Requirements, Summary of Conversations (among the three authors), Arthur D. Little, Inc., Cambridge, Mass. March 3, 1965, 7 pages (unpublished)

scientists and technicians. Absent are overall planning of systems, the overall role of mechanization, and coupling between actual problem areas and the research on information processing sponsored by the Federal agencies. Technical solutions to the national problem of making the best use of STI has been underway for about 10 years without visible results, but technology alone is not the only avenue for progress and rationalization. Improved management and coordination can also contribute. The authors pointed out, even in 1965, that STI is being viewed as a National Resource rather than as property of an individual, a laboratory, or one or more agencies or branches of government. They recognized the growth of a network of interagency committees and subcommittees concerned with STI, all responsible to the Office of Science and Technology, the focal point of major management decisions affecting the Federal STI programs. They then reasoned that a major improvement in STI management capabilities of OST provides an avenue for introducing orderliness, but OST is sadly understaffed to do the total job properly. Their solution was that a group be set up to provide technical support over a three-to five-year period. Both OST and BOB would be assisted by this group, which would number in the vicinity of 30 persons. This approach was considerably more economical than the "Capping Agency" concept of the Systems Development Corporation's, which called for perhaps 10 times that number. Knox saw this approach in favorable light as a contract adjunct, but nothing came of it. Giuliano and his associates made a splendid contribution by their appraisal of the difficulties to be overcome and by inventing an organization designed to get the job done. There is no telling where we would be today if the proposal was accepted in total or in part.

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After two years of service as Chairman of COSATI, Lt. General William J. Ely, Deputy Director of Defense Research and Engineering (Administration and Management), announced his decision to resign. Hornig acknowledged his contributions with the following message: ¹

...During the period of your chairmanship, COSATI has evolved into one of the most effective instruments of the Federal Council for Science and Technology. You can claim most of the credit personally for the degree of organization it achieved and the extent to which it was made to focus on the right problems and to make a start at doing something about them. In particular, the initiation of the National Information System(s) group will, I am sure, eventually result in major progress....

The leadership provided by Ely was unmistakable. With the single-mindedness of a military commander embarked on an important mission, Ely transferred his skills and his determination to the growth of COSATI. The members of COSATI during this period were strong and aggressive men. They recognized the importance of the COSATI mission and worked hard to make their agency STI programs into model operations. They were also aware of the competition among the agencies to demonstrate the superiority of their programs and overall stewardship. Most of them had come from industry or science and technology; there was no such thing as a trained STI manager, university-trained for the purpose. The members of COSATI responded to their leader positively and with obvious respect, working long hours with dedication and enthusiasm. Ely set high standards within his own agency. His Director of Defense Technical Information, an engineer, like Ely, had come from Dupont Company to take on the position. Walter Carlson was a unique, hard-driving individual, with great skill and talent. He could organize, communicate, analyze, plan, and deputize. He also knew much about technical information programs as a consequence of his work at Dupont and the U.S. engineering community. Carlson was a source of significant support and strength for General Ely during 1963 and 1964, but Ely had a keen mind and considerable intelligence and drive. It was Ely who brought the author of this book to his office in 1964, who left his post as Director of Army Technical Information reluctantly, to be the Executive Secretary of COSATI.

¹ Hornig, Donald F. to Lt. Gen. William J. Ely, USA, personal letter, dated April 6, 1965, 1 page, unpublished.

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It did not take long, however, to get caught up in the crusade and come to appreciate the drive and warmth of General Ely.

In reflecting on his contribution, one has to remember what was said by Senator Hubert Humphrey at his 1962 hearings of the Subcommittee on Reorganization and International Organizations, Senate Committee on Government Operations, reported on in the first chapter of this book. The hearings were on the subject of interagency coordination of information and Humphrey was excoriating the sorry state of preparation by the agencies to cope with the flood of knowledge that they were generating. Pointing to the Department of Defense, he said: "at the highest policy levels of the Office of the Secretary of Defense, and at the highest military staff levels in the armed services, there was not a single officer devoting full time to the problem of managing information on R&D." He also grumbled, "Why is it that a department which spends well over a third of a billion dollars a year for computers for administrative purposes alone states that it is difficult to find computer time to record \$7 billion worth of R&D?" How much this criticism by Humphrey stimulated the Office of the Secretary of Defense to make General Ely available to chair COSATI is not known, but it was bound to have some influence on making Ely available and bringing Carlson on board.

There was another contribution that Ely made that has not been sufficiently appreciated. During the early days of COSI then COSATI, the basic work group of COSATI was an operating Committee, which created task groups to undertake specific work in designated areas. The fundamental interest of COSATI at that time was document control, reflecting the basic interests of the COSATI members, who controlled their agency technical documentation programs. Only a few of the members of the "club" were interested in the broad spectrum of scientific and technological communications, in modern data-processing developments, and with R&D management information. At that time, NASA was unique in being concerned with across-the-board science communication matters. General Ely was convinced that insufficient attention was being given to the larger picture and that there was a strong need for longer range programs. It was his view that unless changes were made, COSATI members would lose interest in the goals of COSATI and concentrate only on

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their own rapidly growing agency programs. It was therefore decreed that several changes were in order including the reorganization of COSATI.

In the Spring of 1965, the changes to be made were announced. The Army R&D Newsmagazine carried the story.¹

Realignment of the structure of the FCST's Committee on Scientific and Technical Information (COSATI) effective this month, provides for establishment of a subordinate organization of eight panels. COSATI Chairman Lt. Gen. William J. Ely, Deputy Director of Defense R&E (Administration and Management), announced the plan for reorganization in a memorandum to members of the FCST. Expanding functions of COSATI require virtually a full-time chairman and General Ely is relinquishing this additional position he has held for two years.

The news release broke into new ground by revealing:

William T. Knox, vice president of ESSO Corporation, until he joined the staff of Presidential Science Adviser, Dr. Donald F. Hornig, in September 1964 as a technical assistant for scientific and technical information, will take over as chairman of COSATI.

Colonel Andrew A. Aines, Director of Army Technical Information, until he moved to the staff of Defense Director of Technical Information, Walter M. Carlson, in June 1964, will continue as executive secretary of COSATI. He will be physically relocated from the Pentagon to the White House Executive Office Building.

These changes were made by Dr. Hornig to attain "a closer working relationship between the Office of Science and Technology, of which he is director, and the committee, particularly COSATI of the Federal Council for Science and Technology, of which he is chairman." The Army R&D Newsmagazine article goes on to report:

The House Select Committee on Government Research, chaired by Representative Carl Elliott, is a report to the 89th Congress titled Documentation and Dissemination of R&D Results (reported on in the first chapter), recommended that COSATI be provided with "teeth to enforce" cooperation between Federal agencies for more effective integration of scientific information activities. A possible solution might be for the White House Office of Science and Technology to implement decisions based on COSATI recommendations, the former being closer to the seat of Executive authority."

The new panels, which were created to operate along functional lines to provide for wider and more continuous coverage of areas of common interest to the Federal agencies, are: Information Generation, Operational Techniques and Systems, Information Users, Information Processing Technology, International Activities, Budgets and Statistics, External Relationships, and Education and Training.

¹ U.S. Army, Realignment of COSATI Establishes Eight Panels Along Functional Lines, Army R&D Magazine, Monthly Newsmagazine of the Office of the Chief, Research and Development, Vol.6, No.4, April 1965, Washington, D.C., pp 1 and 3.

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The Army Newsmagazine further quoted General Ely who in his memorandum to FCST members stated:

No fundamental organizational changes had been made in COSATI since it was established and that the realignment now is the result of extensive study of future needs to improve its effectiveness.

To make way for the new structure, present work groups will be discontinued as soon as their tasks are completed, or if work remains to be done they will be phased into the new panels. The new Panels will be made up of five to seven persons competent in specific fields. Use of outside consultants is acceptable. Nominations for the new members are to be made by the member agencies of FCST.

At the time that General Ely made his announcement of the reorganization of COSATI, these task groups were in being: Conspicuity, Delegated Agency, Descriptive Cataloging Standards (including a Corporate Author List Group), Initial Distribution of Executive Agency R&D Reports, R&D in Information Science, Government Depository Library System, Technical Vocabulary Compatability, Translation Activity, National System for Scientific and Technical Information, Scientific and Technical Journal Literature, and Inventory Feasibility. Two ad hoc committees were also listed: Language Compatability in Mechanized Storage and Retrieval Systems and Social Science Translations. The Conspicuity Task Group submitted its report and was dismissed. The Delegated Agency Task Force was dismissed, but its program was taken up by the Task Group on National Systems. The Descriptive Cataloging Standards, Corporate Authority List group and Technical Vocabulary Compatability group turned in reports and products that were accepted by COSATI. The R&D in Information Science Group prepared a preliminary report; its function was absorbed in the Information Sciences Technology task group. The Government Depository Library System was discontinued along with the Translation Activity task group. The National System Task Group was continued under the chairmanship of William T. Knox. The Scientific and Technical Journal Literature and Inventory feasibility efforts were terminated with interim reports. Social Science Translations program was also referred to the National Science Foundation for further work outside of COSATI. In early 1965, the Ad Hoc Interagency Committee on Language Compatability in Mechanized Storage and Retrieval Systems completed its work with the preparation of a literature review.¹

Newman, Simon M.,

¹ Henderson, Madeline M., Moats, John S. and Stevens, Mary E., Cooperation, Convertibility and Compatibility Among Information Systems: A Literature Review, National Bureau of Standards Misc. Publication 276 Washington, D.C. June 15, 1966 pp 140

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The Appendix of this publication contains a total of 660 references in the literature. The recommendations made to COSATI are summarized as follows:

Encourage the use of the Federal procurement authority to promote greater compatibility in the equipment produced by various manufacturers.

Elimination and reduction of barriers to scientific communication by promoting a policy leading to more favorable copyright conditions, by pushing the preparation, elaboration, and revision of classification systems in neglected fields, and by pressing for changes in editorial, page makeup, and even typographical practice that make typed and printed text more amenable to reading and processing by machine.

A responsible, far-seeing coordinating body (even if only advisory) should direct attention to problems and possible solutions in the area of present barriers to scientific communication. Without such a reduction of barriers compatibility and/or convertability within and between isolated subsystems may make things worse.

The recommendations were so general in nature that it was difficult to tie them to specific actions that could be taken by the COSATI community. The work of this task group actually started in late 1963, when Admiral Martell was the chairman of COSATI. The attenuation of the task was one of the reasons why it did not have the effect that the problem really required. The report was not completed until mid-1966. Part of the problem was that the work was done as an NSF grant without any constraints as to when it was to be completed. The project turned out to be a disappointment to the officers and members of COSATI, who had expected more from the task group. Nevertheless, it was a useful bibliography on the subject and it probably proved valuable to scholars and others interested in the subject.

In early 1965, it was determined that a cooperative program with the Chemical Abstracts Service, Columbus, Ohio, was needed by the Office of Science and Technology and COSATI to assist CAS in the development of a computer-based registry of chemical compounds. To achieve this a considerable amount of research and development was needed. The Department of Defense, the National Institute of Health and the National Science Foundation co-sponsored the project with NSF acting as the contractor. After a few years and a couple of million dollars, CAS created the registry, which at the time of the writing of this book, included over five million chemical compounds. The registry is of great value to all organizations in the public and the private sector involved in

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chemistry. Its achievement is a monument to the close cooperation between the public and private sectors that existed in the decade of the 1960s.

In March 1965, the Office of Science and Technology threw its support behind the Hill-Harris bill to strengthen the support for medical library improvement in the United States. Earlier, OST had supported a similar program to strengthen medical libraries through Title II of the Administration's Higher Education bill, but it was concluded that the Hill-Harris bill route would have a better chance than the former.

On February 8, 1965, the OST Ad Hoc Panel on Scientific and Technical Communications, chaired by J.C.R. Licklider of MIT, submitted its report. In brief, the report concluded that the problem of information is different from other problems of concern to OST because STI was a field in its own right and required special handling, even though information and its technology are also part of every other field. It will take an unusual melding, accomplishable under the guidance and urging of OST; of public and private efforts to rationalize the handling of ST in the United States. Consequently, OST should strengthen its leadership in the field of science and technology communication by adding to its regular staff, by increasing its use of panels and consultants, and by obtaining the cooperation of other organizations in the public and the private sectors. The report was sent to the members of the President's Science Advisory Committee for comment. One answer received from John R. Pierce, one of the foremost communication scientists in the world in the Bell Laboratories, is worth excerpting: ¹

This is a diligent and well-informed report and my comments may seem peripheral to the careful work that the Panel has done. I do feel, however, that the points that I raise are central to the general flow of useful scientific and technological information. One obstacle to the flow of information as opposed to documents is the huge volume of publication of essentially unevaluated technical output. The preparation of reports, whether or not there is anything of value to report, is an obligation in connection with Government contracts. The preparation of technical papers and their publication are necessary to the

¹ Pierce, John R., Memorandum to the members of PSAC, dated April 8, 1965, (Unpublished) 2 pages.

advancement of junior faculty members. The contents of these papers are seldom accurately evaluated because review procedures are sloppy and there are so many papers and so few that are worth reading that the majority of papers go unread after publication. This large body of dross complicates the problem of information retrieval and makes document retrieval a hopelessly confusing and ineffective substitute for information retrieval. I don't know what can be done about the situation. If a man's publications were adequately reviewed prior to promotion or appointment on a university faculty, useless and misleading publication might be discouraged. If review procedures were better or if articles were generally published by abstract only, the text on request, the information retrieval problem might be easier. If some built-in measure of quality such as use or citation, or review by a competent man engaged in preparing a summary were used as a part of an information retrieval or distribution system, some advance might be made. As things now stand, the trouble is that the bulk of the published literature which is useless stands between a man and his getting what he wants or needs.

Readers who recognize that the problem described by Pierce still continues almost two decades later will smile about the lack of progress made in this area. Citation indexing has helped somewhat, but the notion that only abstracts should be published has not received much support. No gains have been registered in the quality of unevaluated technical reports turned out in copious numbers as the fruit of Federal R&D programs, nor have universities universally imposed a tough-minded review of the quality of publications of candidates for promotion and tenure. There is no doubt but that Pierce could write the same letter in 1984 and have it meet the indifference that was manifest in 1965.

Returning to the COSATI effort to work closely with the private sector, a series of meetings were held with the technical press to improve the dissemination and use of Government-generated R&D information and to keep this community informed of plans and actions of the Federal agencies. Donald A. Schon, Director of the Institute for Applied Technology, National Bureau of Standards, Department of Commerce, played a leadership role in this endeavor. After holding a series of meetings with members of the technical press and government representatives, Schon wrote:

Recently we have held a series of exploratory meetings of representatives of Government agencies and the technical press...This memorandum, summar-

1 Schon, Donald A., Memorandum to William T. Knox, OST, Executive Office of the President, Subject: Meetings with Technical Editors, May 12, 1965, pp3, plus two attachments from an editor and from a representative of a publisher.

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izing what we have done and are planning, is for your information, and through your good office for the information of COSATI members. Agency representation included the DOD, NASA, and AEC as primary producers of technical information, and Commerce (Clearinghouse) as a major distributor. Technical press editors from 10 journals attended. They were chosen from a list of 25 editors of engineering and scientific publications, submitted by a group of publishers, as representative of the controlled circulation and paid circulation press, unaffiliated companies, and journals in various subject fields. Also represented was the American Society of Business Press Editors, and the Editorial Division of the American Business Press, Inc, a publishers group.

Five subjects were explored: 1/ Press views on the security and clearance requirements of the Government. 2/ Encouraging Government researchers to publish in the technical press. 3/ Role of Government and the technical press interpretation of industrial application potentials of Federally-sponsored R&D information. 4/ The need for education of the press as to the availability of Government information services. and 5/ The need for the press to explain its operations to Federal management and policy officers.

Editors pointed out that they lacked understanding of security regulations and that information officers were more geared to the needs of the daily press than those of the technical press. They asked for continuing communication with the Government and a mechanism to resolve general nature problems. They called on the agencies to publish more technical articles in their periodicals, especially to reach special audiences. They wanted to know more about such Government services as the Clearinghouse and R&D agency disseminating centers. They also called for a general conference with government top-level management and policy people as well as working level information officers for an exchange of views and the development of a closer working relationship.

The American Business Press, Inc. organized a group to interact with the government subsequently, called the Government and Business Scientific and Technical Information Committee (GOBSTIC) that interacted closely with COSATI during the 1960s. After 1970 the relationship ceased, thus ending an important era of cooperation. Since then there has been little or no interaction between the two groups, a sad turn of events.

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The close interaction that was going on with the professional societies during this period is exemplified in another event, the Congress of the International Federation of Information Processing Societies in 1965. First was a reading of a Presidential message:¹

I am always happy to welcome people who come from other lands to sit down and discuss our common tasks and common problems with us. Information processing is one of those key functions on which our modern society depends, and so I am especially glad to welcome the guests and congratulate the sponsors of this Congress. The wealth of new information now being produced daily in our world must be used effectively, and we must exploit the great and wholly new opportunities for progress which are becoming available from scientific advances. Advanced information processing technology will be a major factor in making the results of our research programs available to those who need them in our efforts to improve education and health services, and in improving job opportunities for all our people. We are eager to extend these services for the benefit of all mankind. The recent proposal by the United States to the World Health Organization to develop a worldwide early warning system for drugs is dependent on your technology. You have my best wishes for a most successful and productive meeting.

--Lyndon B. Johnson

Second was a keynote talk given by the Science Advisor to the President, Donald F. Hornig. Here are a few excerpts of his address:²

...as the President said in his welcoming message, there is hardly an area of our lives which is not already being transformed by developments in information processing technology....you here assembled will play a leading role in this almost revolutionary transformation. This is no task to be confined within national boundaries. Science and technology recognizes no national boundaries; good work is being done in many countries....the computer is at the heart of the revolution in information processing. The Federal Government, processing as it does huge amounts of information, frequently under urgent pressures for rapid correlation and recall, has been a major factor in the development of the computer industry in this country....Most of the important advances in space exploration, weather forecasting, and atomic energy would not have been possible without the computer....Furthermore, the use of computers to support advanced management techniques is becoming common in a broad range of governmental activity, after initial successes in military areas and supply management.

Hornig pointed out that the number of computers in the Federal government had grown from 10 in 1954 to 1,767 in 1964, a phenomenal growth that was only the beginning.

¹ Johnson, Lyndon B., Presidential Message to the Congress of the International Federation of Information Processing Societies, New York, N.Y., May 24, 1965, 1 page.

² Hornig, Donald F., Address to the Congress of IFIPS, New York, May 24, 1965, pp 15.

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Relating Hornig's remarks to what is currently happening is to reveal that the leadership of the Federal agencies dwindled over the years. Private industry surged into that leadership in recent years, while the government programs took a back seat. The public scolding administered by the Grace Commission to the Federal agencies in regard to their poor track record in the computer area recently parallels the decay and dismemberment of the Federal STI program. Returning to Hornig's key note speech, he called for considerable better management of computer activities in the Federal government, reflecting a concern expressed by President Johnson, who had directed the Director of the Bureau of the Budget to undertake a comprehensive study of the management of ADP activities for the Executive Branch. The President reported the results of this study to Congress on March 2, 1965 and called for legislation to strengthen the procurement and management of the computer for and in the Federal government. Hornig spoke to the opportunities lying ahead for the country in the civilian economy. He mentioned mathematical modeling of the total civilian economy, the completion by the Department of Commerce of a five-year, intensive study of the inter-industry structure in the United States, the first major "input-output" study made possible by the computer. He saw opportunities in the transportation field, weather reporting, the marine field. He spoke at length about opportunities in medicine. He said:

In medical care we are on the threshold of revolutionary changes in information processing techniques. Hospitals first used computers for complex accounting problems. Before long the resident staff was experimenting with calculating the statistical significance of clinical observations. In recent years the emphasis has been on developing "on line" gathering of data directly from the patient and the nurse, the immediate processing of these data, and rapid display of the correlated results to the attending physician.

He described what the Massachusetts General Hospital in Boston was doing with computers. He expressed his hopes that the application of the computer in processing natural languages would come in the future, difficult though it might be to achieve. He credited Vice-President Humphrey for stimulating many executive branch agencies to make intensive studies of their information systems as a fertile field for applying advanced information processing technology. He stated:

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of Science Information Service on information matters. Knox argued in the letter that the Science Information Council should give way to a similar committee that would be set up by the National Research Council of the National Science Academy. He also stated that he had undertaken a preliminary discussion with NRC/NAS on the subject. Here again Hornig decided that such a course of action would not be appropriate.

Knox addressed another memorandum to Hornig during this period on the subject of Representative Pucinski's bill to set up a Federal VINITI-like information center in Chicago, Illinois, H.R. 664.¹ After going into detail on what Representative Roman Pucinski was trying to establish in his home district, Knox wrote at the end of his memorandum:

It is possible that the National Referral Center could be moved to Chicago. If you think the political game is worth playing in this instance, I could do some exploration with NSF about moving the Referral Center to Chicago.

This was an astonishing turn of events. The National Referral Center was part of the Library of Congress, even though funded by NSF. On the whole, it was doing an effective job, based on the lack of complaints from NSF or from any other source. It was doubtful that it could be pried away from the Library of Congress or that NSF would make such a proposal, recognizing the political risks in so doing. It is assumed that Hornig recognized this risk, since the subject was dropped.

Only a few days later, Knox sent a note to Hornig² reporting a conversation that he had with Pucinski, who was sharing the platform with him at the 3rd Annual Meeting of the DOD-sponsored Interservice Data Exchange Program on 17 March 1965. Knox stated that Pucinski vigorously presented the reasoning behind his H.R. 664. While he acknowledged the "new look" at OST, Pucinski believed that the enactment of his bill was still

¹ Knox, William T., Memorandum to Dr. Donald Hornig, Subject: HR 664, Pucinski's Bill, 16 March 1965, 1 page.

² Knox, William T., Memorandum to Dr. Hornig, Subject: Conversation with Congressman Pucinski, 19 March 1965, 1 page.

The Office of Science and Technology and the Federal Council for Science and Technology have also studied the coordination and integration of the individual agency systems. At this time, a substantial effort in my office is being devoted to advising and assisting the Federal agencies and interested national groups on ways to establish a more effective and efficient national network of information systems for the support of science and technology. There has been considerable progress. The use of the computer for storing journal bibliographic data in the medical field, coupled in a revolutionary manner with a composing machine, has become routine at the National Library of Medicine. Great reductions in the time required to print the published version of Index Medicus have been accomplished and a side benefit (which is growing in importance steadily) of computer searches of stored literature has also been achieved.

He talked about the agreement reached with the American Chemical Society's Chemical Abstracts Service to conduct large-scale development trials of a computer-based registry of chemical compounds. He said with justifiable pride:

It is our hope that this registry will become the foundation for a nationwide, and possibly international, computerized network of chemical information systems, serving industry, governmental agencies, and universities.

The application of computers to library operations was underway, he pointed out, stating:

Not only are the traditional library functions of acquisition, announcement, distribution, etc. being studied for mechanization, but there are bold, imaginative plans for a completely different type of library that would employ a time-shared computer, with remote inquiry and display stations. Limited experiments give real promise that this approach will be fruitful.

The Federal government's interaction with professional societies was described and Hornig called upon them to provide help in "bringing about the new order in close coordination with the Federal government." He concluded by giving the attendees this advice:

A good part of the modern so-called information explosion consists of unreliable facts and unimportant or trivial observations, and one of the most important aspects of information processing is to learn what to discard, to learn to throw away what is not worth processing.

This call for discipline on the part of information-generators and information-handlers is similar in intent to the views expressed by John Pierce. Successful accomplishment of this goal is far from being realized today. There are no serious penalties for adding to the information explosion being advocated.

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The deep involvement of the Science Advisor to the President, Donald Hornig, in STI matters was in evidence when he delivered the keynote address at the dedication of the new Chemical Abstracts Service building in Columbus, Ohio, in June 1965.¹ On that occasion he said:

The extent to which the working scientist depends on the work of others has been clearly stated by one of the greatest of all scientists, the atomic physicist, Ernest, Lord Rutherford, who said: "I have also tried to show you that it is not in the nature of things for one man to make a sudden, violent discovery; science goes step by step and every man depends on the work of his predecessors. Scientists are not dependent on the ideas of a single man, but upon the combined wisdom of thousands of men, all thinking the same problem, and each doing his little bit to add to the great structure of knowledge which is gradually being erected."

Hornig then traced the growth of the Chemical Abstracts Service since 1907:

It is striking to me to realize that the average increase in research reports in chemistry and chemical engineering has been 9.3% every year since the first post-war year, 1946. This growth rate means a doubling every 7.8 years of the annual output of chemistry-related publications. It also means that we double our total recorded information in chemistry and chemical engineering every 11 to 12 years....Perhaps I was only kidding myself in my early days (Hornig is a chemist) when I thought I was able to keep up with the literature...When one considers that much of what is significant in science and technology is published in unfamiliar languages, it is clear that the working scientist and engineer is faced with almost insuperable problems in attempting to keep himself informed or to find specific information to help make a decision.

He praised the Chemical Abstract Service for its ability to get working chemists to assist it in abstracting the exploding world literature in chemistry, following with a description of what was happening in the government. He said:

It was in 1958 that the President through his President's Science Advisory Committee first took a good hard look at the implications of the developing situation in terms of the national research and engineering program. Two alternative possibilities were studied. One was the establishment of a large and highly centralized scientific information agency, financed by the Federal Government, or by a combination of government and private industry. The second was the establishment of a science inform-

¹ Hornig, Donald F., Keynote Address at the American Chemical Society's dedication of the new Chemical Abstracts Service building in Columbus, Ohio, 3 June 1965. pp 17.

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ation service of a coordinating type, which would strengthen and improve the present system by taking full advantage of existing organizations and the specialized skills of persons with long experience in the field. The recommended solution called for the establishment within the National Science Foundation the Office of Science Information Service. This service was to assist, cooperate with, and supplement the many existing scientific information programs, but was to "take over" none of them.

Hornig then described the 1963 PSAC (Weinberg) Report with a few of its highlights:

The transfer of information is an inseparable part of R&D. All those concerned with R&D -- individual scientists and engineers, industrial and academic research establishments, technical societies, Government agencies -- must accept responsibility for the transfer of information in the same degree and spirit that they accept responsibility for R&D itself...

Since strong science and technology is a national necessity, and adequate communication is a prerequisite for strong science and technology, the health of the technical communication system must be a concern of Government. Moreover, since the internal agency information systems overlap with the non-Government systems, the Government must pay attention to the latter as well as the former.

He then elected to give a report of accomplishment of his office:

Standing here tonight, some two-and-a-half years after the last PSAC report, how do we assess the national state of affairs in the national network of information systems supporting science and technology? I believe that much has been accomplished in the area of traditional approaches. Publication of many scientific and technological journals has been supported by the Federal Government, and steps have been taken to bring about a more effective and efficient network of abstracting and indexing services in the United States. This is no simple job; there are more than 6,000 scientific and technological journals published in the U.S. and over 500 abstracting and indexing services.

This was followed by comments on the role of traditional libraries, which he asserted were still the best way to assure the use of information. He described what was happening within the Federal government and in the private sectors where many specialized, automated information systems were being established. The larger problem was now to tie the many systems together through switching devices that would enable better connection of users to the information and documents they need. This needs to be done within the Federal government so that its information systems talk to one another. The problem, he stated, was analogous to the one faced by the Bell telephone System years ago, when it began the establishment of a nationwide network of many local and

regional systems. He then described the role of the specialized information centers and other mechanisms that were being considered as the means for improving the national STI system. He concluded his remarks by discussing the signing of a contract between the National Science Foundation and the American Chemical Society initiating a two-year experimental program to provide a much-needed, high speed source of chemical information. This approach, he felt, was the prototype for further steps that the public and the private sector could take to dramatically improve the national science and technology information system.

While Hornig became a staunch supporter of scientific and technical information systems, this did not carry over into non-scientific information areas. Bill Knox had met with Neal Peterson, Julius Cahn and Will Fazar, the latter a member of the BOB staff, to discuss the creation of a management information system dealing with programs under jurisdiction of Senator Humphrey - poverty, civil rights, Peace Corps and Federal-State and local government interactions. According to an internal memorandum,¹ Hornig was non-committal on the subject, probably because he felt that he would be operating outside of his jurisdiction. Knox suggested that a joint BOB-OST Panel on Management Information Systems be considered, but nothing came of it. Had Hornig consented to the proposal and assuming that such a panel came into being, it might have had a seminal effect on the development of improved management information systems in the Federal government. Perhaps this was a lost opportunity, but Hornig's refusal to get OST involved was probably prudent.

Hornig also refused to go along with another recommendation made by Knox,² who thought it would be appropriate to abolish NSF's Science Information Council, the group of non-government information experts, who advised the Director of NSF, and the Head of the Office

¹ Knox, William T. Memorandum to Dr. Donald Hornig, Subject: Vice-President Humphrey's Request for More Effective Management Information System, 9 March 1965, 1 page.

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desirable. Knox said that he had spent three hours with the Congressman filling him in on what was taking place at OST. Pucinski, he said, stated that he would withdraw from the scene if OST felt it premature for him to hold his hearings on the bill. He also recognized that the Federal agencies were hostile to his Chicago STI Center proposal. Knox stated that Pucinski provided some excellent points about building a program away from Washington. One of these was that it was wise to create a center in a state with a strong congressional delegation to insure congressional support. Knox reported: "My reading of Pucinski is a good deal higher than it was before I had the meeting with him." Hornig was probably amused by this exercise in modern Machiavellianism, but there is no record of any response that led to any action. Subsequently, Pucinski held his hearings, but he was not able to sway Congress to vote for the center. In essence, he was conducting a sideshow in congressional shadows compared to the center-ring program of the Committee on Science and Astronautics' Subcommittee on Science, Research and Development, led by the able Congressman from Connecticut, Emilio Q. Daddario, who was at that time the dominant figure in Congress concerned with science communications.

Early in 1965, there were stirrings in the international information scene. Questions were being asked about United States policy in dealing with developing countries. Knox believed that the United States would be unwise to deal directly with the developing world, preferring to work through UNESCO and its regional representatives. UNESCO floated its view that it would like to establish an international scientific and technical information activity and research center with the involvement of the International Congress of Scientific Unions. It was Knox's view that the Organization for Economic Cooperation and Development could take on the channeling of information systems in technology and ICSU might support information systems for science. OECD had created an Information

Policy Group that had become fairly active. The 24 nations that made up this international body were vigorously seeking major information systems in each member country as candidates for internationalization. The International Committee of the Federal Council for Science and Technology began to interact more closely with COSATI and its International Information Activities task group. In 1963, a panel of the President's Science Advisory Committee had addressed international exchange of technical information as a subject of increasing concern and concluded: ¹

Any further rationalization of the international system of scientific communication will go right to the center of the whole matter of international cooperation in science and will have a corresponding effect in fashioning science into a stronger instrument of international understanding.

Chinn also reported in the attachment to the agenda:

The Select (Elliott) Committee on Government Research in November 1964 stressed the necessity for coordinating all foreign Federal activities in documentation and dissemination of technological information. The necessity is made even more apparent by the recent report of the Committee on Scientific and Technical Information (COSATI) which summarized the international data-exchange agreements of various agencies of the U.S. Government. Although the summary does not claim to be complete, it reveals the startling total of many thousands of data agreements with virtually every country of the world. The Department of Agriculture alone has almost 7,500 agreements with agencies and organizations abroad. The Department of State reports more than 4,000 treaties and international agreements to which the U.S. is a member. Many of the agreements contain provisions for the exchange of STI. Similarly, virtually every agency represented on FCST has international agreements.

Except for the comments made by Chinn and the establishment of the COSATI Panel on International Information Activities, the above mentioned COSATI report seemed to have little stimulative effect on the Federal agencies. While today there is considerable concern about the two-way flow of STI at a political level, there was hardly any during the early and mid-1960s, except among the managers of Federal STI. In a presentation made by William T. Knox, COSATI Chairman, before the House Subcommittee on Science, Research and Development, ² in describing the work of this Panel, he said:

¹ Chinn, Herman I., Attachment to the agenda for the FCST International Committee, July 13, 1965.

² Knox, William T., Presentation on COSATI to the House Subcommittee on Science, Research and Development, July 27, 1965. pp 7. (Daddario Subcommittee)

In these days of plans for computerized information systems serving an international community, it is important to have a panel to help coordinate Federal activities, to set standards for systems, to recommend international exchange policy and procedure, and to improve the many translation programs carried on in and out of the government.

Some of the highlights of Knox's comments to the Daddario Subcommittee, which was then engaged in a study of the National Science Foundation, including its science communications program, are as follows:

The scope of COSATI's concern is very broad, since it includes and is related to all the scientific and engineering disciplines and to all of the technology. COSATI has existed for only three years, thus there are many problems still waiting solutions. Included are the systems actually used to transfer documents and information from one user to another, but also initial publication following generation of STI, needs of various user groups, education and training of information system operators and the producer-user groups in the use of modern information systems, and research and development to improve information systems.

Knox discussed the size of the Federal government's STI program, pointing out that it is difficult to arrive at precise figures, largely because it is difficult to make a distinction between some information activities and the research or engineering activities of which they are an integral and essential part. To all scientists and engineers, information transfer is an inseparable part of their science and engineering. He pointed out that one study of the work habits of chemists has shown that research chemists spend as much as one-half their time in communicating. Estimated obligations for STI in FY 1966 amounted to \$380 million according to a COSATI survey. Knox stated that Federal agencies had taken a number of actions as a result of COSATI studies and recommendations, including: a uniform Federal agency "page charge" policy, a microfiche standard for technical reports, a uniform method for identifying Federal reports (descriptive cataloguing), and a subject category list for the announcement of technical reports. Knox stated that COSATI was the mechanism that endorsed several new organizations to carry out special functions of the national STI network: The Clearinghouse for Federal STI, the Science Information Exchange, The National Referral Center for Science and Technology, and the National Standard Reference Data System. He continued with these words:

About six months ago, Congress asked that the Executive Branch exercise stronger, more aggressive leadership in this area. An interdepartmental COSATI task group was set up to develop the conceptual framework for a

plan for improvement of the overall complex of STI activities in the United States...It was necessary to consider the activities outside the Federal establishment, since the non-Federal and Federal activities are mutually dependent on one another, and large sums of Federal funds go directly or indirectly in support of these activities. Since there is no one organization representing the non-public sector, continuing dialogues with representatives of the private sector groups was undertaken. The objective was to arrive at a concept toward which the information systems in the United States could develop. To date, the task group has focused its efforts on formalized communication mechanisms, primarily document-handling mechanisms, with the help of a study team from the System Development Corporation. The functions and relations of major components of the document-handling system, such as the National Libraries, college, university and other research libraries, and abstracting, indexing, and alerting services are being studied. Another major area of interest is the impact of advanced technologies on the information transfer network.

Knox informed the Subcommittee of the results to date. He said:

We have concluded that the far-flung, wide-spread nature of the information system can be roughly conceived as in part analogous to the telephone network, which is a mechanism for connecting people who want to know or to talk, with other people who either have the desired information or who are willing to listen. It is a mechanism completely at the service of its users, and it demands only an elementary knowledge to be able to use it. It operates on a real-time basis, however, and this is a big difference from information systems, which in part transfer knowledge acquired some years ago to today's users. To recognize this difference in user need, and partly because of the different functions and staff involved, we have in our preliminary thinking divided the body of the national network of information systems into two parts. These parts will be a complex of library systems (document-oriented, such as traditional libraries), and a complex of information evaluation and retrieval systems (information-oriented).

Expanding on this interesting concept, Knox pointed out that there are several libraries operating at a national level handling documents in such fields as medicine, agriculture, engineering, earth sciences, physical sciences, and behavioral sciences. Each of these would be concerned with acquiring all pertinent literature in its field, cataloging or indexing it, announcing its availability, and providing copies on request. He added:

These would be structured, operated, and administered in somewhat similar ways. Perhaps each library would be responsible to a Federal agency with primary mission responsibilities in its field of interest, such as the National Library of Medicine which responds to the mission of the Department of Health, Education, and Welfare. Coordination and compatibility among the libraries would be a primary goal from the beginning and a question for early decision would be the mechanism for bringing about this coordination....The main role of these libraries would be to serve users who will be satisfied with documents. The other part of the system -- the complex of evaluation and retrieval systems -- would consist of activities of Government agencies, universities, industries, and societies (professional, scientific, and trade) that are concerned with providing information, as opposed to documents, to specific audiences directly concerned with science and technology.

Knox found that Congressman Daddario and his Subcommittee were deeply interested in what the Office of Science and Technology^{and COSATI} were attempting to do in both improving the Federal STI program and "blueprinting" a national information system for science and technology. There was some overlap between the Carl Elliott effort and what the Daddario Subcommittee was seeking to accomplish, but the former's effort was considered to be a one-shot project, while the latter's was a continuing one. Representative Pucinski's project to create a single information center modelled after the Russian VINITI was considerably more limited in intent, being confined only to the establishment of STI dissemination center. During the same period, Senator Carl Hayden, the Chairman, Joint Committee on Printing, was in contact with the Office of Science and Technology to find out more about COSATI's project to develop a microform standard for use by the Federal agencies.¹ A status report was sent him by OST, which appeared to have satisfied his curiosity. It was to be many years later that the Joint Committee on Printing became interested in the use of microfiche for dissemination of agency-generated technical reports by the Superintendent of Documents.

Congress interest in improved STI programs came to the fore once again in a letter sent to the President by Representative Carl Elliott, then the chairman of the Select Committee on Government Research.² Elliott wrote:

The Select Committee on Government Research is concerned with the documentation, dissemination, and use of R&D results as part of its current studies. With the explosion of scientific and technical knowledge, scientists and engineers are dependent upon the quality of scientific information in order to enable them to continue their research efforts. Similarly, administrators depend on such information as a management tool in setting criteria and priorities. Many people and organizations, including the FCST, have been instrumental in identifying problems and active in the search for new directions and goals in this area. I should like to propose for your consideration a meeting which might be called the "White House Conference on Scientific and Technical Information." Such a conference would bring together the men and women who direct the current STI efforts for the purpose of identifying goals

¹ Hayden, Carl, Chairman, Joint Committee on Printing, Letter to Dr. Donald Hornig, Director, Office of Science and Technology, Executive Office of the President, dated June 28, 1965.

² Elliott, Carl, Chairman, House Select Committee on Government Research, 88th Congress, to President Lyndon B. Johnson, dated May 7, 1964, pages 2.

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and developing ways to attain them... Great strides have been made in the development of electronic and optical devices to facilitate the flow of information. Through such a conference, we should be able to mobilize the leadership of our country to accelerate procedures and policies to enhance our national R&D endeavors. Your reaction as to the feasibility of such a Conference will be greatly appreciated.

Hornig answered the letter for the President at the request of the President, stating:

The President has requested me to contact you to exchange views on this important area. As you know, STI is a subject to which the Office of Science and Technology is giving special attention. Through the various machinery at our disposal, such as the FCST, the PSAC, and outside panels and consultants, we are taking steps to: (1) improve the scientific and technical communication for the better management of the R&D projects of the Federal Government; (2) coordinate STI activities of the science-oriented departments and agencies; and (3) insure that the results of R&D are preserved and made accessible to the scientists and engineers. The idea of a conference of the type you are proposing clearly deserves consideration....It is conceivable that the effectiveness of such a conference might better be achieved if it were sponsored by some other agent than the White House. Conceivably, such a conference could be sponsored by the National Science Foundation, the Office of Science and Technology, or the quasi-government organization, the National Academy of Sciences.

It turned out that the staff persons of the Select Committee on Government Research were upset with OST's opposition to a White House Conference and refused to agree that one undertaken by the National Science Foundation or the National Academy of Sciences would be adequate.¹ According to his diary item, Kelley stated that he would seek support for an OST conference on management information in conjunction with the Bureau of the Budget. This area dealing with current awareness information was of deeper concern to the Select Committee than scientist to scientist information. The date of the diary item would indicate that there were discussions going on within OST for many months about the "White House Conference." When Knox took over from Kelley in 1964, he wrote a short note to the leaders of OST, saying that he thought that there should be one, stating that in addition to the Select Committee, Stafford Warren and others had also advocated such a conference. It was his belief that it should be a "White House Conference on Scientific, Engineering and Technological Information," whose theme could be "The Evolution of a National Plan."²

¹ Kelly, J. H., Meeting with Select Committee on Government Research Staff, Micah Naftalin and Annette Murray, Daily Log, 1 July 1964, 1 page.

² Knox, W.T., Memorandum to Hornig, MacLeod, Beckler, Kidd and Kelley, dated 6 October 1964, asking for comments on his proposal, pp2.

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Once again, the matter of a White House Conference on Scientific Communications - the Next Twenty Years was discussed at a meeting involving William T. Knox, Walter M. Carlson, and Andrew A. Aines at the OST on 2 August 1964, ten months later.¹ It was agreed that a White House Conference on Scientific Communications - the Next Twenty Years, to be held in the Spring of 1966, should be recommended to Hornig. The theme of the meeting should be tied to the work of the Task Group on National Information Systems for Science and Technology. It should be run by a team from COSATI and a contractor and funds up to \$20,000 should be raised for the initiative. Vannevar Bush or William O. Baker were suggested as chairmen and keynote speakers. It would last for two and one-half days, and the concluding speaker might be Vice-President Hubert H. Humphrey. Knox asked Aines to prepare a draft memorandum to Hornig with the proposal. Knox sent the memorandum to Hornig to obtain his endorsement for a White House Conference on Scientific Communication.² He stated as the primary reasons for holding the Conference:

To obtain publicity and to marshal support within and without the government for the reorganization or new legislative proposals which can now be seriously anticipated as a result of the COSATI-SDC efforts (national system development).

Thus, it was evident that the reason why the Elliott (Select) Committee wanted to see a White House Conference had shifted considerably, one year later. On 5 November 1965, Knox wrote a memorandum to the members of the President's Science Advisory Committee summarizing the reasons for a White House Conference and providing details of how it would be run.³ The major purpose would be to provide an Executive Branch forum for public discussion of the key issues in scientific information. The opening address would be made by the Vice President and the closing address by the President. A week later, PSAC met and made it clear that they were "unenthusiastic" about having a White House Conference on Science Communications. They also questioned the feasi-

¹ Aines' Notes of Meeting held at OST, 2 August 1965 in a Memorandum for William T. Knox. pp 4.

² Knox Memorandum to Donald F. Hornig, subject: White House Conference on Scientific Communication, dated 13 August 1965, pp 2.

³ Memorandum from William T. Knox, OST, to members of the President's Science Advisory Committee, subject: White House Conference on Scientific Communication, 5 November 1965.

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bility of trying to undertake the establishment of a national system for STI with two people in OST and a small supporting staff in NSF to operate such a system, even with contractor support. Lacking a vote of confidence from PSAC, the Science Advisor did not appear to think it appropriate to push both of these projects. While the Select Committee on Government Research did not accomplish its aim to stimulate the holding of a White House Conference on STI, it did undertake one action that demanded a considerable amount of attention in the Federal R&D agencies. This was a survey of scientific and technical information services. The first part of the survey to be completed by the department or agency was 11 pages long and contained 49 questions. The second part was to be completed by the directors of individual information facilities. This consisted of 29 questions on a five-page document. A considerable amount of data was received by the Elliott Committee, some of which was used in preparing the Committee's Study No. IV, Documentation and Dissemination of R&D Results.

The future of a congressman is not always a certain one. Representative Carl Elliott who was making much headway with his Select Committee on Government Research found himself defeated at the polls. When this news was broadcast, the Select Committee began to disintegrate without completing all of the work it had set forth for itself. The Committee's Study No. IV, of course, survived, but the follow-through that would have been instrumental in getting action was absent. The notion of a White House Conference on STI, which did not get PSAC approval, became a dead issue with the defeat of Carl Elliot at the voting booth.

During the year 1965, the affairs of the National Library of Medicine and biomedical research information received considerable attention in the Office of Science and Technology. Early in the year, William T. Knox addressed the NLM Board of Regents at a meeting held on 18 March. He told the Regents that the Task Group on National Systems was counting heavily on NLM as the focal point for document-handling in the biomedical area. Scott Adams, the NLM deputy director stated that NLM was being pressured by outside groups for copies of MEDLARS tapes. He stated that the director of NLM

At this point

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Knox indicated that he was troubled by the difficulty of obtaining a coordinated and reasonably uniform practice among the Federal agencies. NLM, he pointed out, had taken the position that it would provide information services to users at no cost to them, the volume and the quantity of services would be limited by the appropriations received by Congress. This was in contrast to what the Department of Commerce was doing in its dissemination policy, requiring that users paid reasonable fees for information services. The subject, Knox stated, would be discussed at a meeting of the Task Group on National Systems. In a memorandum to the acting Director, OST, Knox wrote:¹

I pointed out my doubts that Federal agencies should attempt to abrogate unto themselves the responsibility for assessing changing market requirements for information services, and providing the new services to meet the new market demands. This role appears to me to be more appropriately performed by private entrepreneurs, drawing upon the bibliographic resources of NLM.

There is no record of a response by Colin McLeod. But Knox, who it should be remembered came from the private sector, where he had spent all of his career before coming to the government. He appeared to be brooding on the problem as seen in a personal letter to the Director of a drug firm. Said Knox:²

The Federal biomedical community seems suspicious of private entrepreneurship in biomedical communication. Surveys for the needs for better biomedical communication are funded handsomely, but the end-result seems to be foreordained: namely, bigger and better Federal Government-operated information services. The latest case is the joint support by DoD, NIH, and NSF of the initial stages and testing of a chemical compound registry system by the Chemical Abstract Service. The biomedical supporters appear to feel that there will be something ethically unsound if CAS accepts the initial development money from the Federal government, and then continues to sell its total information services to Federal Government agencies or grantees. There is some talk of "tax-payers paying twice."

Knox' attitude about the role of the Federal government versus the private sector would probably be more in keeping with Administration views two decades later, but it is interesting to remember that Knox was a member of the PSAC (Weinberg) Panel that stated (1963): "Since the information process is part of the R&D process, agencies that support R&D in fields that are relevant to their missions (should) accept responsibility."

¹ Knox, William T., Memorandum to Colin McLeod, Deputy Director, Office of Science and Technology, reporting on the Board of Regent's Meeting, 23 March 1965, held at the National Library of Medicine. (Dr. McLeod, who was a doctor of medicine, was interested in all medical and health information programs.)

² Knox, William T., Personal letter. dated 5 April 1965.

ity for supporting and otherwise carrying out information activities in these fields... In these fields, the agencies should maintain a strong internal information system and should support non-Government information activities, always striving to blend the Government and non-Government systems into a consistent whole." The Weinberg Panel felt strongly that the cost of R&D should also include the cost of dissemination of the knowledge produced. The ambivalence of Knox was interesting. He was the Chairman of the National Systems Task Group and in that role was quite ready to see an enlarged mission for the Federal agencies to assist the private sector establish and maintain information programs supported in whole or part by the taxpayers, but somehow, he wanted marketplace mechanisms to be part of the process. Federal information managers, on the other hand, recognizing that their programs were being supported by the taxpayers, had some kind of block when it came to asking the taxpayers to pay private sector vendors for the same products. To this day, this problem has not been worked out to the satisfaction of the public and private sector information managers.

In the decade of the 1960s, there was strong recognition by OST and COSATI that the United States should be providing a higher degree of world leadership in the establishment of global Information networks and data bases. In April 1965, Knox visited the initial meeting of what was to become the Information Policy Group of the Organization for Economic Cooperation and Development (OECD), the 24-nation international body established in the post-world war II days as a Marshall Plan outgrowth. It was, in the main, the "club" of the advanced technological nations in the Free World. He reported that there was a great deal of appreciation expressed by the representatives of other countries for the OST and COSATI efforts, for the willingness of the United States to share its data bases and national policy "knowhow" with them, and for its willingness to assist other countries and international organizations in the development of networks and data bases for scientific and technical information interchange. During this period, the President approved a DHEW recommendation calling for the establishment of an international system to monitor and report adverse reactions to drugs to the World Health Assembly in Geneva held on May 4, 1965. Under its pro-

visions an International Adverse Drug Reaction Center would be established by the World Health Organization to develop a world-wide early warning system for drugs, a system that would have helped prevent the widespread tragedy of the sort which resulted from the use of thalidomide. President Johnson said in addition:¹

We have already established an excellent national system for monitoring adverse drug reactions, under the U.S. Food and Drug Administration. WHO designated centers in other fields include: The International Shigella Center in the Communicable Disease Center in Atlanta, the International Rickettsial Disease Center at the NIH Rocky Mountain Laboratory in Montana, the International Center for Biological Standards at the State Serum Institute in Copenhagen, and the World Influenza Center at the National Institute for Medical Research in London.

One bit of unpleasantness resulted from this initiative. The Surgeon-General was not informed by the Food and Drug Administration that FDA was "pushing" the recommendation in the White House. The COSATI representative from DHEW expressed concern that OST had taken the FDA initiative and had run with it without informing the Surgeon-General. He was informed that this was not the case, that OST had become involved with it after the decision was made, and had been involved in the review of the proposed Presidential statement. If anything, the problem was centered in DHEW, which should have been informed by FDA about its intentions before the notion of the International Adverse Drug Reaction Center was submitted to the White House. Fortunately, all of the parties were instructed about the need for better coordination by the incident.

During the same period, another incident took place that caused some controversy. At a COSATI meeting held 28 April 1965, an action paper was discussed on a study of a Federally sponsored periodical in newspaper format. The purpose was to make available to scientists and engineers in and out of the government news about science and technology as contrasted to technical information about government-supported R&D. Although professional society publications carried some information of this kind, it was usually thin in content and coverage, during the decade of the 1960s. A task group

¹ White House Press Release, 21 April 1965.

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was formed to look into the matter, made up of government and private sector persons, and to report to COSATI. Wrote Knox six months later:¹

Clouds of erroneous and adverse publicity have enveloped an activity by an ad hoc COSATI group to encourage one or more commercial publishers to make a serious attempt to produce a commercially viable daily science "newspaper." The use of the word "newspaper" was unfortunate; the newspaper fraternity is mildly aroused at the threat of government encroachment upon the freedom of the press, and related issues. At present, the publisher showing the greatest interest in preparing a realistic dummy, with the advice of several COSATI participants, and will produce several thousand copies for a market survey. At no point in the discussions so far has the idea of government publication of this journal been raised, but this has been the bogey causing most alarm outside.. Discussions are being held with the major antagonists in an attempt to dispel their concerns.

The COSATI task group made its report, showed the COSATI members the dummy newspaper that was prepared by McGraw-Hill officials, then waited for some commercial or not-for-profit professional society to field the test the concept. It would be a matter of great satisfaction to state that the idea caught on and a science newspaper came into being as a result of a COSATI initiative. The truth is that nothing happened. The newspaper community, after being told that it was not an intention of the Federal government to establish and support such a paper, turned its attention to other matters. Perhaps, some day an entrepreneur with lots of faith and money will come along and put out a science newspaper for the much larger community that exists today, but the chances that the government will do so range from remote to never.

The Federal STI managers had been working closely with professional societies such as the American Chemical Society, the American Institute of Physics, the Engineers Joint Council of the United Engineering Trustees, and others for many years, but when NSF's Office of Science Information Service began to support the updating of their publication programs with the infusion of dollars, and when the COSATI Task Group on National System(s) for STI became active, efforts were redoubled to work with this sector in a team operation to better understand and enunciate their respective responsibilities. In this connection, Knox wrote to the Head of OSIS:²

¹ Knox, William T., Status Report for October 1965 - Scientific and Technical Information. This was an internal Office of Science and Technology Document. 8 November 1965. 2 pages.

² Knox, William T., Letter to Burton Adkinson, Head, OSIS_NSF, dated 29 April 1965.

The National Systems Task Group has confined its attention to the handling of documents after initial publication. Regarding the upcoming meeting with the National Research Council and the professional societies, shouldn't we make a plea for a better professional society effort to rationalize initial publication. This is an area that OSIS has been busy in. We could call for tighter editorial standards, suggest critical reviews of the article to be published simultaneously with the article, and certain structured formats for citations to indicate the relation of the paper to previously published ones. We might also raise the question of the role of the professional societies in educating a new generation of scientists and engineers in the use of modern information handling systems. We might stress to newcomers that it is a privilege, not a right, to publish. Many papers are being published as an extension of dissertations, implying that a large part of these publications exist because of the circumstances not the value of their contents.

On the 14th of May 1965, Adkinson met with representatives of professional societies, providing for them a description of what the National Systems Task Group was trying to accomplish and where they were at the time. A second meeting was held with representatives from the private information sector six months later. In preparation for the meeting, a paper was written by Dale Baker, Director, Chemical Abstracts Service, one of the leaders in the professional society community.¹ He posed the question: what are the problems that non-Federal Services face that are different from those of the Federal abstracting and indexing services? In consideration of the lack of consensus that still exists today, here are some of the points made by Baker:

A big difference is in the mechanism of justification of how you spend a dollar. Non-Federal groups have limited resources to improve coverage, speed, and depth; to set up new information tools and services; and to establish satellite information centers. Government policy is that it does not wish to support non-Federal secondary services on a continuing, long-range basis.

On pricing policies, it is the Government policy to pay principal cost of publications out of agency appropriations with price to the public being only the Printing Office charges for their over-run costs. This results in prices for publications at abnormal rates. For Government Congress is the single source of funds, whereas the non-Federal has multiple sources of funding: subscribers, dues, subsidy, etc. In addition, non-Federal prices

¹ Baker, Dale B, Director, Chemical Abstracts Service, COSATI Task Force and Non-Federal Representatives Meeting, October 4, 1965, pp 5.

are market-controlled. Thus societies have to be self-supporting in the face of "give-away" programs of government.

On discipline versus mission orientation, mission-oriented services tend to be devoted largely to technology and too little to basic science. They tend to decrease information flow across mission borderlines. Education, however, is by discipline, not by mission; thus Government for the most part leaves to non-Federal services the responsibility of providing information support to education. Without basic research technology would dry up. Discipline-oriented services make information available on no fixed time scale; they are prompt also archival. Back issues handling is a real problem. Only agriculture and public health in the mission area have similar concerns; other mission area services last only as long as the mission.

On coverage, there are holes in the mission services, while disciplines must have completeness. Disciplines have a limited number; missions could be unlimited, thus the former must be available for multiple use by missions. Disciplines are primarily concerned with published material, missions with classified and unpublished.

In Baker's view, there is a need for continuing cooperation, mutual respect, and a recognition of responsibilities for each group. He called on the government to accept responsibility of protecting the non-Federal activities from undue infringement by the government; to make the scientific disciplines a primary part of a national system, and to see that there is cooperation between the non-Federal services, collectively and bilaterally. The government should understand how the market place operates and act accordingly. It has supported R&D to a major degree and has the responsibility to support information activities in the disciplines in proportion. Mission-oriented services should have practical objectives, he believes, and should use yardsticks to evaluate the information services. ACS has been fearful since 1955, when Senator Humphrey held hearings, of Government domination, regulation, and operation of STI activities. The philosophical and moral issues have been serious and have conflicted with proven experience of decentralization in the field. Baker mentioned the existence of a bill then before Congress that had passed the House for \$117,000,000 in one area of information activities. He did not identify the area, but it certainly could not have been in the scientific and technical information area. Baker agreed that the ACS and government shared the same objectives to achieve efficiency in the STI effort and the management of R&D, and that ACS will continue to work with the government as its charter requires.

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The views of the American Institute of Physics paralleled some of those of the American Chemical Society, but there were some differences. AIP stated that:¹

A national network of STI systems is a desirable and necessary development. The national interest is involved and it is appropriate for the Federal Government to assume responsibility....COSATI's formation and its program is to be welcomed by the scientific and technological community, but the scientific community in a democracy must function in the manner of a democratic society. Thus Federal and non-Federal participants in the total information network must share in its planning, development and ultimate management. The planners must also recognize that science is international and that each national network must be designed for cooperation with other national networks. The area of greatest sensitivity for relationships between the Federal and non-Federal sectors is that of pricing policy. The non-Federal sectors cannot maintain a partnership unless the cost of answering a user's question is identical whether he enters the network at a Federal or a non-Federal point.

In the same document, the Biological Abstracts organization said:

There is no question but that we support the broad concept of a national complex of science information systems. COSATI's role should be to demonstrate the importance of evolving the concept of a national system, and of designating its elements and functions. It should provide for formal representation of non-Federal groups' position and interests and ensure that final decisions resolve as fully as possible conflicts of interest between the Federal and non-Federal groups. There should also be established a non-Federal counterpart to COSATI with virtually the same responsibilities that COSATI assumes for the Federal agencies...Continuing communication between the two groups would increase the confidence of one group in the other and emphasize the common interests and goals...rather than magnify their differences.

Other professional societies, such as: the American Psychological Society, the Institute of Food Technologists, the American Society for Mechanical Engineering, the American Mathematical Society made similar points, but also called on the Federal government for financial support. It would be fair to say that the general attitude among all professional societies during the 1965 period was favorable to Federal government involvement and support, recognizing that the conventional STI systems that had worked so effectively up to the 1950s were being overwhelmed by "Big Science," the proliferation of information and the sharp increases in costs. Funds for modernizing professional society information systems were simply not in the budgets of virtually all of these organizations. The assistance given to the professional societies through NSF and other agencies during this era did much to help them survive and function.

¹ Statements made in connection with the COSATI Task Force and Non-Federal Representatives Meeting, Washington, D.C. October 4, 1965.

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In the middle-1960s, there was considerable recognition that the Age of the Computer was dawning, even though most information and computer scientists and managers took this expectation as a "given." The reality must have had a stimulative effect on the Bureau of the Budget, whose function was more pitched to the management of Federal resources than exploration of the future. It was suggested by the Bureau of the Budget that there be established a Committee on Computer Sciences in the Federal Council for Science and Technology.¹ Kidd stated that it would not be possible to organize such a committee until the Fall 1965, but that it would be possible to set up a study group earlier to determine if such a Committee should be formed. If it found that such a course of action was desirable, the task group should outline the charter of the task group, spell out the relationship between computer sciences and operating problems related to computers, and indicate the relationship of the work of the Committee to other governmental, industrial and university groups working on various aspects of the computer sciences. Although, it would have been appropriate to create such a task group, it never came to pass; this was probably a missed opportunity to bring all of the involved communities together. There is a possibility that the existence of a small COSATI Panel on Information Sciences Technology may have weighed in favor of not creating such a group, but it would have been a small possibility. During this period, there was a National Academy of Sciences task force on the computer, chaired by Dr. Anthony Oettinger, Harvard University, that was very active in this area. This too may have been considered by Dr. Hornig in his decisions. OMB and its predecessor, BOB, have often been criticized for their failure to support planning, problem-solving and similar larger issues, but this is one time that this indictment was not true. The record should so show. There is a degree of irony in the matter. It was always the view of the Information Group in the Office of Science and Technology and leaders of COSATI that there was a mandate to consider the handling and use of STI in connection with the growth of the conduits that carried and manipulated information together, but

¹ Kidd, Charles V., Memorandum for Dr. Donald Hornig, Chairman of the Federal Council for Science and Technology, Subject: Status of the BOB Suggestion that an FCST Committee on the Computer Sciences be Established, Washington, D.C., July 13, 1965, 1 page.

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this was not the prevailing view in the Office of Science and Technology nor among computer sciences. If this way of looking at information and handling and delivery systems had caught on earlier, it is probable that there would have been much more progress today than has been achieved. This, of course, can only be conjecture.

Not all of the public carriers in the U.S. communications sector showed disinterest in the thrust to improve Federal and national STI programs. One in particular, the Western Union Telegraph Company, apparently recognized the importance of substantive information and data programs in its future. Western Union wrote a letter to a White House office, mentioning the passage of House Resolution calling for the establishment of an agency in the Executive Office of the President to be known as the President's Advisory Staff on Scientific Information Management.¹ He wrote:

On the assumption that H.J. Res. 666 may ultimately be approved by Congress and the President's Advisory Staff on Scientific Information Management is created, The Western Union Telegraph Co. requests an opportunity to designate a competent and qualified official to serve on the Advisory Staff of the proposed agency.

The letter was referred to William T. Knox, OST staff, who responded as follows:²

...there is considerable question whether the resolution will be passed by Congress. There was a similar resolution, S.J. 202, introduced on September 10, 1964, by then-Senator Humphrey...Based on my inquiries, I question whether the Administration will endorse the present version, H.J. Res. 666. If the situation changes, I will let you know.

The information passed on by Knox proved to be correct; the resolution got nowhere in Congress, but its effect was to further demonstrate the bulldogged determination of Humphrey to elevate the level of concern for better STI management to the highest levels of the Administration. The supposition is that General McConnell passed the information to The Western Union Company. Over the years that company experimented with data base services, anticipating some of the electronic data base products and services that have proliferated during the late 1970s and 1980s.

¹ McFall, R.W., President, The Western Union Telegraph Co., New York, N.Y., letter to Lt. General James D. O'Connell, Director of Telecommunications Management, Office of Emergency Planning, Executive Office of the President, Washington, D.C., 24 November 1965, pp 2.

² Knox, William T. to Lt. General James D. O'Connell, letter dated 24 November 1965,

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The failure to pass S.J. 202 and H.J. Res.666 by Congress may have also been influenced by other activities going on in the White House during 1965 in the information and the communication areas. One of these was the White House Conference on International Communication. A key report was prepared and presented at this conference.¹ It is discussed in another chapter, but the eminent members of the committee were a guarantee that considerable attention was given to the White House Conference. Geneen was at that time the Chairman of the Board and President of the International Telephone and Telegraph Corporation. Other members were Palmer Hoyt (Editor, Denver Post), Frederick R. Kappel (Chairman of the Board, AT&T Co.), William B. Quarton (President, American Broadcasting Stations, Inc.), and General David Sarnoff (Chairman of the Board, RCA). The key recommendation of the National Citizens' Committee was that the United States propose establishment of and offer full support of a new agency in the United Nations to be called the VOICE of PEACE, which would act as a world source of knowledge and reference for the collection, communication and dissemination of all information useful for peaceful purposes. Re-reading the report of this Committee in the tumultuous mid-1980s, a period in which the U.S. Government is considering departure from UNESCO, shows the disappointment that this country has in how the United Nations and its bodies have changed over the years as they have become politicized and antagonistic to the principles and philosophies that the United States espouses. It is doubtful that the establishment of the program recommended by Geneen and his associates in the United Nations would have made a great difference, but we will never know.

As the year 1965 drew to a close, William S. Beller, writing in a technical journal, had this to say about the status of the Federal STI program:²

There is little doubt the Administration will soon formulate and announce plans for a national information program. This conclusion is based on: (1) suggestions from several committees of Congress that the Executive Branch exercise stronger, more aggressive leadership in the information area; (2) resulting top-level planning effort of the Committee on Scientific and Technical Information (COSATI), a task group of the President's Federal

¹ Geneen, Harold, et al, National Citizens' Commission Report of the Committee on Communications, presented at the White House Conference on International Cooperation, Washington, D.C., Nov.28-Dec.1,1965, pp 25.

² Beller, William S., National Information Program Impends; President Johnson May Urge Undertaking in Next Budget Message.... Missiles and Rockets, November 1, 1965,

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Council for Science and Technology; (3) finding of the System Development Corporation that such a national effort is essential for pre-eminence in science and technology....William T. Knox, COSATI chairman, told Missiles and Rockets, "It is possible the President will call for a national information program in his next budget message to Congress. This is merely my feeling about it. It would depend entirely on the reactions of the various advisory groups to the President, and on the President." Asked if the mechanism is at hand to start such a program if it were approved, he answered, "Let us say we have an existing system."

Beller then wrote about the growing costs of Federal STI programs, which would be about \$400 million in FY 1966. He stated that individual agencies were obligating from less than 1% to up 17% of their total R&D budgets on STI. He stated that scientific works in journals and papers have been roughly doubling every decade. One observer, he stated, saw the growth curve as hyperexponential - doubling in size every seven years. Beller wrote:

This fact moved Harold Wooster, a DOD scientist, to note that the curve bears a striking similarity to the first half of the growth curve for a bacterial colony - before it starts poisoning itself with its own waste products. He cited several analogous signs ranging from technical libraries outgrowing their shelf space before they are built to duplication of expensive research projects.

Beller looked into the habits of scientists in handling information and concluded that although modern information systems would be very helpful to them, they are "loath to change their way of getting information, preferring to pick up the telephone and asking a colleague a question or a having a "bull session" at one of the many scientific meetings to reading a report or monitoring a computer." He quoted the late Derek J. de Solla Price who said about scientists, they "have a strong urge to write papers, but only a relatively mild one to read them." He quoted Knox as having told a House Subcommittee on Science, Research and Development a few months earlier at a hearing that a central management mechanism is needed, a mechanism that might be:

A COMSAT-like corporation deeply involved in the actual operation of the information network, with both governmental and private interests.

A new Federal agency managing all agency STI functions, much as the GSA handles their services.

A new Federal agency restricted to top-level planning and evaluation, with existing agencies continuing to manage their internal information system.

Assignment of top-level planning and evaluation functions to an existing Federal agency.

A continuation of the present multifaceted management.

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In wrapping up his interesting and well researched article, Beller concluded that there were several weaknesses in the concept of organizing a national information system: inclusion of only STI in a national system was not enough. Economic, sociological and legal aspects that figure into solution of technical problems at high levels must be included. Technical and other data must be included in such a system. Systems could be developed in individual scientific fields that would help the workers in these fields, but the systems would not be sufficient for those who work in two or more scientific fields such as biophysics and geochemists. Finally, there is need to look at the cost-effectiveness of the information system, even though there is an intuitive feel that the worth is obvious. To make a national information system worth buying, he pointed out, the problem-solving ability of computers must be part of the package.

All in all, the year 1965 has to be considered one of the important years for OST, COSATI and the Federal agencies. Congress and the Executive Office of the President were deeply involved in STI matters. President Johnson had an almost mystic appreciation for education and the roles of information and communications in furthering education on a worldwide scale. The professional societies were beginning to cope with the proliferation of information in their fields. Through OECD and UNESCO, interest was mounting on more global systems for science and technology information interchange and system development. Concentrated thought was focused on the needs and problems of creating a national STI system. Thought was being given to the non-document aspects of such a system: scientific and technical data (as differentiated from documents), informal (person to person) science communications, and indexing and abstracting of the world's literature. COSATI was vigorous in its coordination and search for improvement of Federal agency STI programs. NSF's support of the professional societies in the planning and building of modern discipline-based information systems was ample and bringing positive results. But special credit needs to be paid to Donald Hornig, the President's Science Advisor, whose concern and involvement made it all possible.